VOLUME XLVIII NUMBER ONE

THE NATIONAL GEOGRAPHIC MAGAZINE

JULY, 1925

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Bird Life Among Lava Rock and Coral Sand
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TO carry out the purposes for which it was founded thirty-seven years ago, the National Geographic Society publishes this Magazine. All receipts are invested in the Magazine itself or expended directly to promote geographic knowledge.

ARTICLES and photographs are desired. For material which the Magazine can use, generous remuneration is made. Contributions should be accompanied by an addressed return envelope and postage.

IMMEDIATELY after the terrific eruption of the world's largest crater, Mt. Katmai, in Alaska, a National Geographic Society expedition was sent to make observations of this remarkable phenomenon. Four expeditions have followed and the extraordinary scientific data resulting given to the world. In this vicinity an eighth wonder of the world was discovered and explored—"The Valley of Ten Thousand Smokes," a vast area of steaming, spouting fissures. As a result of The Society's discoveries this area has been created a National Monument by proclamation of the President of the United States.

AT an expense of over $50,000 The Society sent a notable series of expeditions into Peru to investigate the traces of the Inca race. Their discoveries form a large share of our knowledge of a civilization waning when Pizarro first set foot in Peru.

THE Society also had the honor of subscribing a substantial sum to the expedition of Admiral Peary, who discovered the North Pole.

NOT long ago The Society granted $25,000, and in addition $75,000 was given by individual members to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees of California were thereby saved for the American people.

THE Society is conducting extensive explorations and excavations in northwestern New Mexico, which was one of the most densely populated areas in North America before Columbus came, a region where prehistoric peoples lived in vast communal dwellings and whose customs, ceremonies, and name have been engulfed in an oblivion.

THE Society also is maintaining expeditions in the unknown area adjacent to the San Juan River in southeastern Utah, and in Yunnan, Kweichow, and Kansu, China—all regions virgin to scientific study.

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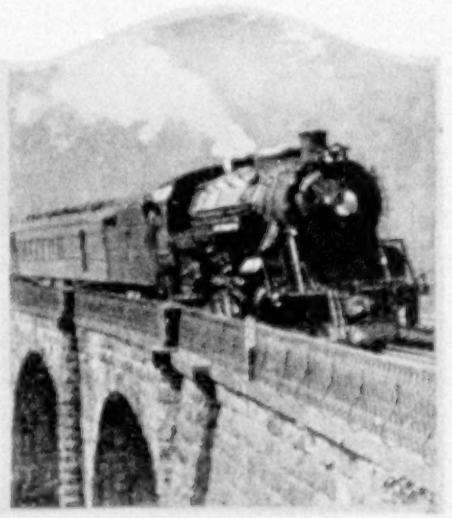
Why the fastest trains in the world are timed with this watch

Be as sure of your time as the railroad conductor is of his

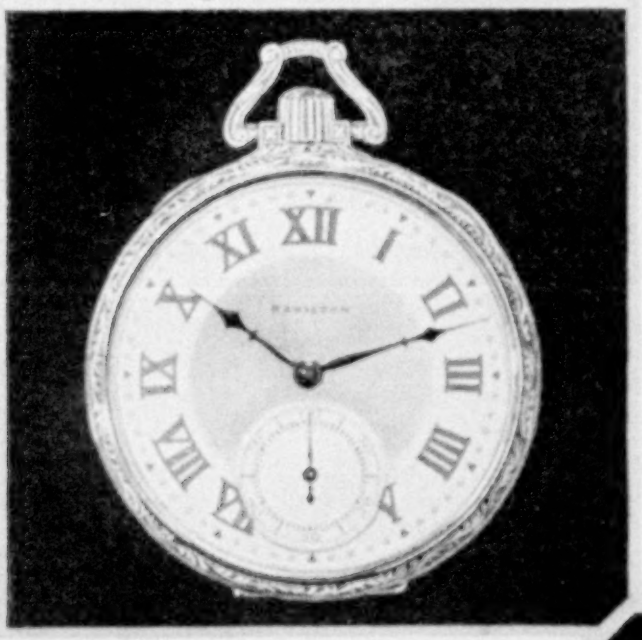


The Capitol Limited, crack B. & O. flier, crossing the Latrobe Viaduct at Relay, Md. This train covers the distance between Baltimore and Chicago in 19 hours. It has made 1261 on-time trips out of a total of 1336. Picture by courtesy of Baltimore & Ohio Ry.

"WHAT TIME HAVE YOU?" Ask this question of a group of business men. Out come their watches. One watch is three minutes slow, another five minutes fast, and so on. But ask this question of a group of railroad men. If there is any variation, it is usually only a matter of seconds.

Yet it is so very easy for every business and professional man to have a watch as unfailingly accurate as the railroad man's. When you buy a watch, get the make he uses. For thirty years there has been one watch that has been generally favored on America's railroads, a watch that has earned the unique distinction of being called "The Railroad Timekeeper of America."

Hamilton



At left—The new Monroe design. Hamilton pocket watches may be had in yellow, white or green gold. 14k or filled, plain or engraved. Prices $48 to $250. You can choose from a wide variety of cases and dials.

Below is the new woman's Tonneau model wrist watch. Milady's Hamilton comes in silk ribbon models, detachable bracelet models and strap models. Cases are plain or engraved in yellow, white or green gold. 14k and filled. Prices, $48 and $60.

This watch of accuracy fame is the Hamilton. It rides in cab and coach of such famous fliers as the Twentieth Century, the California Limited, the Broadway Limited, and the Olympian. When you buy a Hamilton, accuracy is assured.

The secret of Hamilton's accuracy is capacity to take infinite pains. With us every watch is an individual piece of fine mechanism, tested and retested until final accuracy is obtained.

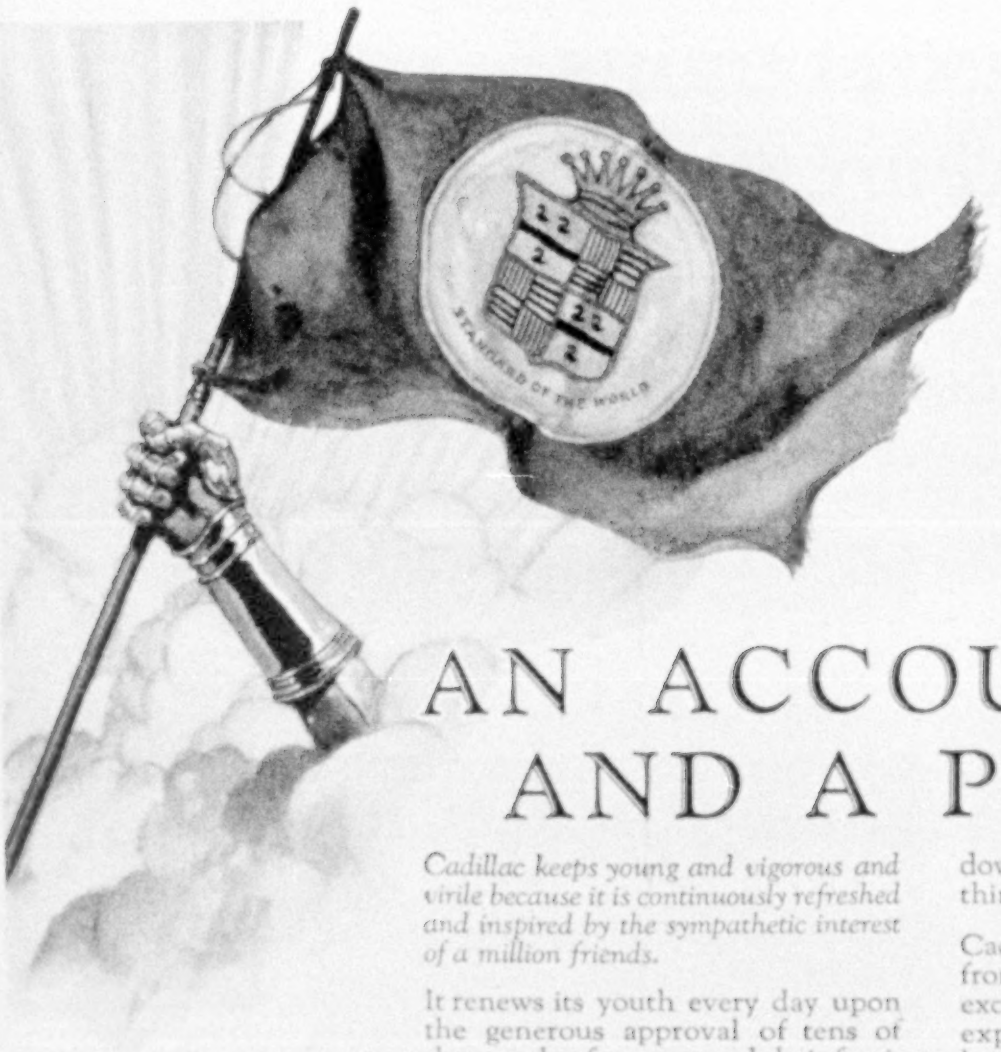
No Hamilton leaves our factory until it has proved itself worthy of the Hamilton name, and is ready to serve you as an accurate timekeeper.

This insures the quality of the Hamilton Watch that you purchase and enables us to give a broad guarantee of satisfaction.

A Hamilton Watch to suit your individual preference may be selected from a number of beautiful cases and dials. Some are simple, graceful, and chaste. Some are beautifully engraved and ornamented. All have an intrinsic beauty that will keep them fashionable after years of service.

Ask your jeweler to show you a Hamilton today. He can show you Hamilton pocket and strap watches for men and charming wrist watches for women. Send for a copy of our new illustrated booklet, "The Timekeeper." Address Dept. 1-D1, Hamilton Watch Company, on the Lincoln Highway, Lancaster, Pa., U. S. A.

XUM



AN ACCOUNTING AND A PLEDGE

Cadillac keeps young and vigorous and virile because it is continuously refreshed and inspired by the sympathetic interest of a million friends.

It renews its youth every day upon the generous approval of tens of thousands of owners and their families who take the time and the trouble to express their friendship for Cadillac—and their faith in its unremitting zeal to serve.

Cadillac is gloriously young after twenty-three years of adherence to the one ambition of remaining the Standard of the World—after ten years of dedication to the task of outstripping the world in the furtherance of the eight-cylinder principle.

It is splendidly young in spite of the fact that its traditions are old—or rather because of the fact that those traditions are so fine and high that they make every working day a new day of increasing zest and inspiration.

It has been said, and it is true, that even if the impossible should happen and the directing heads of Cadillac should wish to deviate by a hair's breadth from the ideals which have dominated Cadillac all these years—they would not be permitted to do so.

They would not be permitted to do so because the great group of master workmen who are steeped in the spirit of surpassing excellence would go on serenely as before—or throw down their tools if asked to do anything less than the Cadillac best.

Cadillac is subjected to a pressure from within and from without to excel itself—the pressure of public expectation and the pressure of honest craftsmanship which can work no way other than the Cadillac way.

What is said here is in the nature of an accounting from Cadillac—a re-dedication to high service published at this moment because of the advent of a new, young, and powerful, executive leadership.

The pledge is from him—and through him, from the solid phalanx of Cadillac executives and workmen who consider themselves servants of the most loyal public any industrial institution has ever enjoyed.

Great things are always under way for Cadillac and Cadillac owners—not merely a maintenance of the high endeavors of the past but a constant striving after things never yet attained.

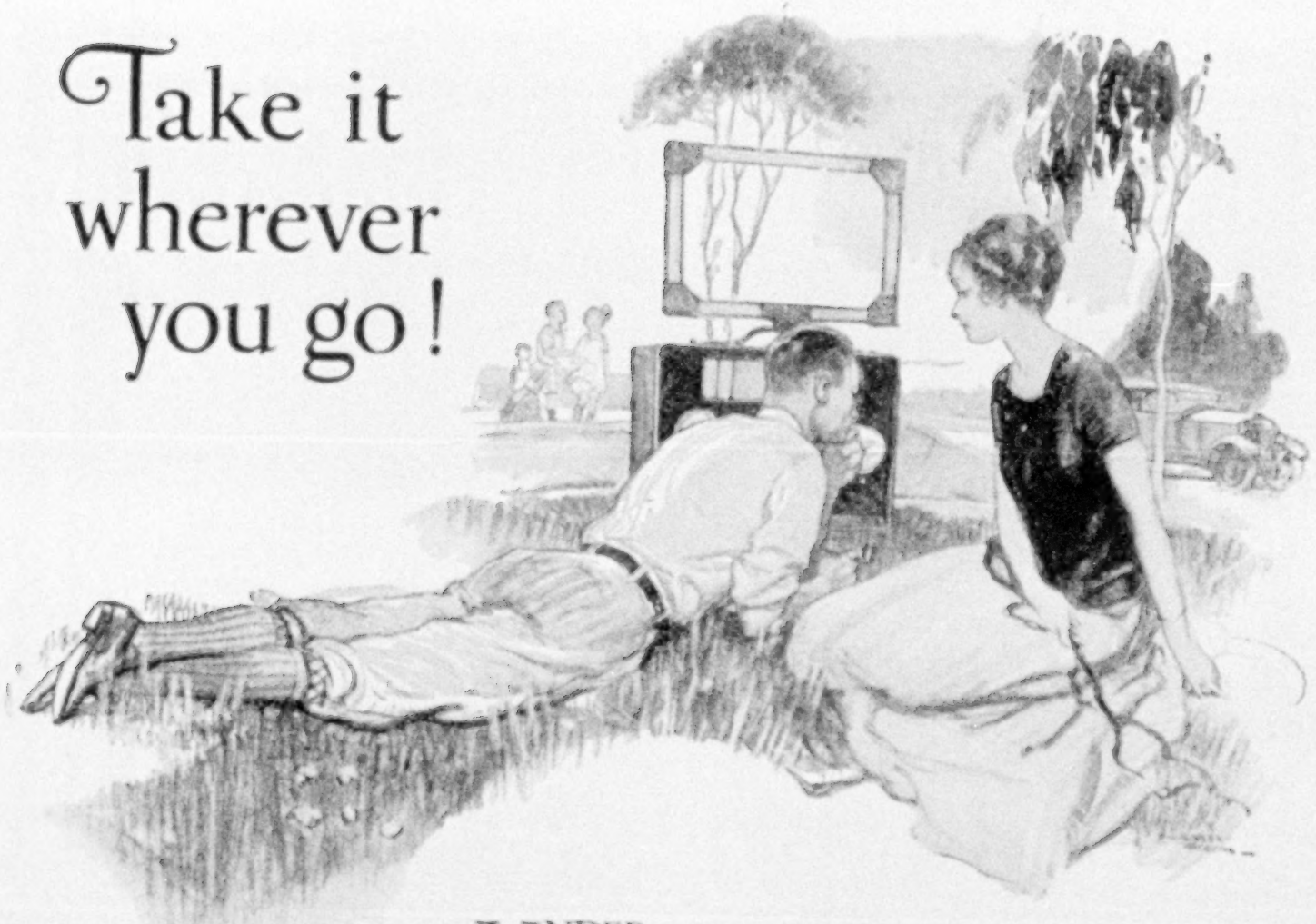
To every Cadillac owner of record the executive head of Cadillac will endeavor at the earliest moment to send a personal pledge of the future.

Meanwhile, because you and a million others count upon it—be certain that Cadillac will never fail to realize your highest hopes.

CADILLAC

Division of General Motors Corporation

Take it wherever you go!



UNDER a tree on a mountain top—tune in. Out on the sea, lazing coolly on the deck—tune in! And off for a motor trip, put into the car one more suitcase—a Radiola Super-Heterodyne *complete*. Its loudspeaker is built-in, its loop in the cover, its batteries inside!

The Radiola Super-Heterodyne is made, now, in two portable models. It is the same far-famed "Super-Het"—with the same fine quality of tone—the same complete simplicity—the same distance performance. But it is portable now—and you can take your entertainment with you everywhere!

Radio Corporation of America

Chicago, Ill. New York San Francisco, Cal.

Radiola

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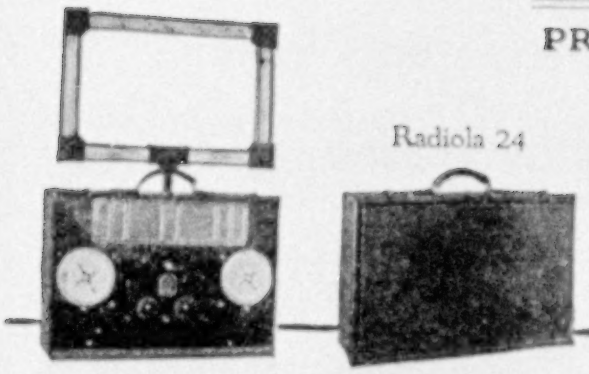
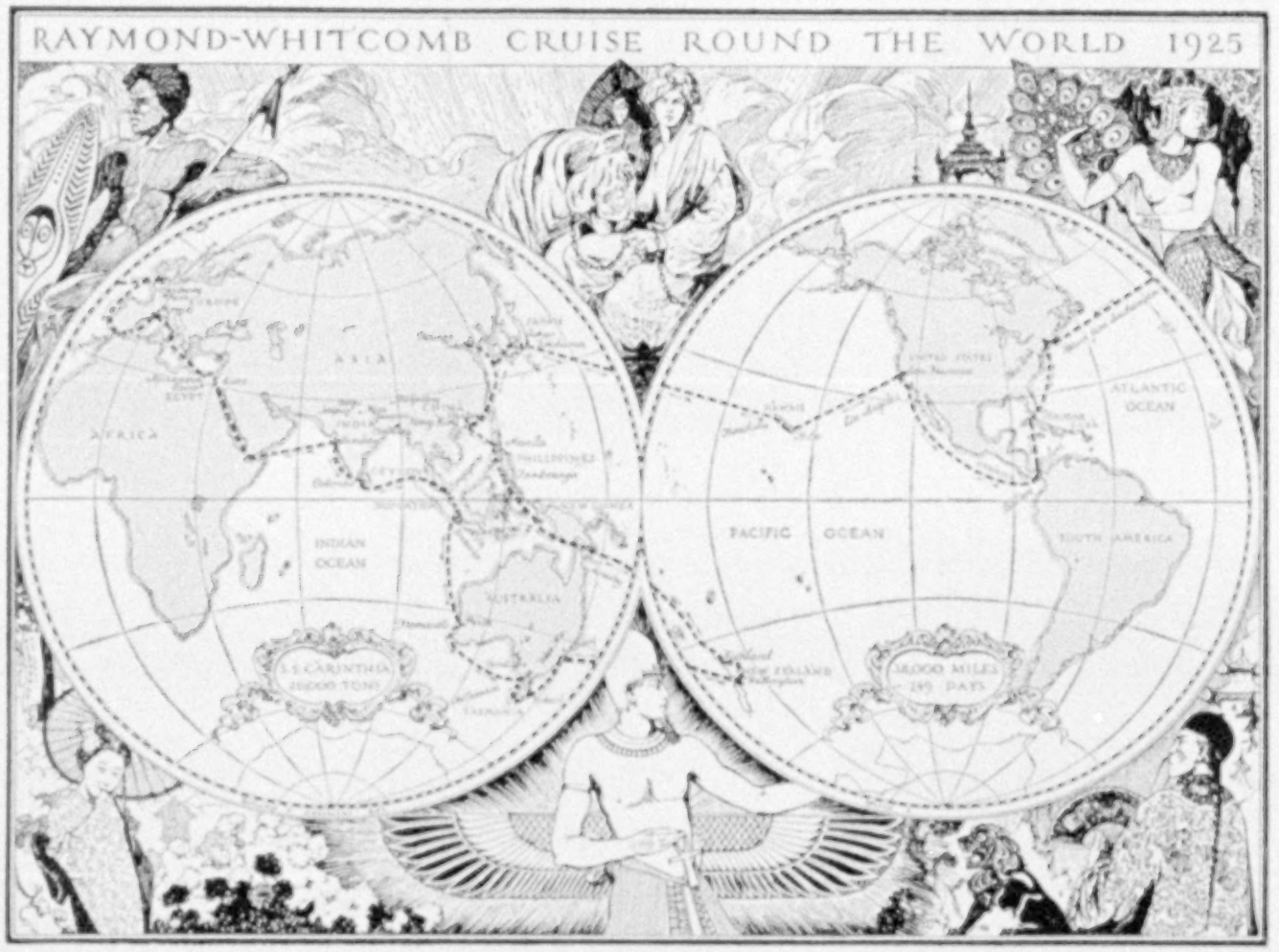


Radiola 24

Built in a suitcase of black cowhide, cobra grain. Open ready for use. And closed for carrying. With 6 Radiotrons UV-199 - $195

Radiola 26

Finished in Walnut. Complete for carrying. And with an extra battery cabinet for home use. With 6 Radiotrons UV-199 - - $225



Round the World Cruise

Sailing on October 10, 1925, the Raymond-Whitcomb cruise will follow a course of 38,000 miles, visiting all six continents and including in its itinerary more ports and inland cities than any other cruise —it is a cruise on which all others might well be modelled.

To the countries usually visited—Japan, China, Java, India, the Philippines—Raymond-Whitcomb has added one whole quarter of the Eastern World—Australia, New Guinea, New Zealand and Tasmania.

Our cruise-ship—S.S. "Carinthia" (20,000 tons)—is the best ship ever to make such a voyage. She has 115 single rooms, 77 rooms connecting with private bath and hot and cold water in every room; gymnasium, swimming pool, squash court and elevators. Rates $2,000 & up.

Winter Mediterranean Cruise
January 28, 1926

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WM. WRIGLEY Jr.

I'd feel almost as lost without my right leg as without my trusty watch

One of a series of little biographies of Elgin Watches

. . . . WRITTEN BY EMINENT ELGINEERS

I find that a great deal can be accomplished in a busy man's life by using up the corners of time that very often are wasted. Punctuality has gotten many a man a good job and kept it for him after he once had it.

Everything in a business way during the last ten years has been run under a very high pressure. Men who used to do one thing are now doing many. And to accomplish many things in a day's work, a watch that keeps time and men who keep time are very necessary.

Many figures have been compiled about many things, some of them astonishing figures. But nobody has ever figured up the amount of time wasted by the average business man in waiting for tardy people to keep an appointment.

Personally, I would be about as well off without my leg as without my watch —which, by the way, is an Elgin.

My father gave me my first Elgin on my twenty-first birthday. I carried this watch for many years and it always kept time, otherwise I would not have kept it. In later years, I have carried an Elgin strap-watch in place of my Elgin pocket-piece.

But both Elgins are what we would call in our business "hundred percenters." They never fall down—are always on the job—and always on time.

—*by* WM. WRIGLEY, JR.

ELGIN

THE WATCH WORD FOR ELEGANCE AND EFFICIENCY

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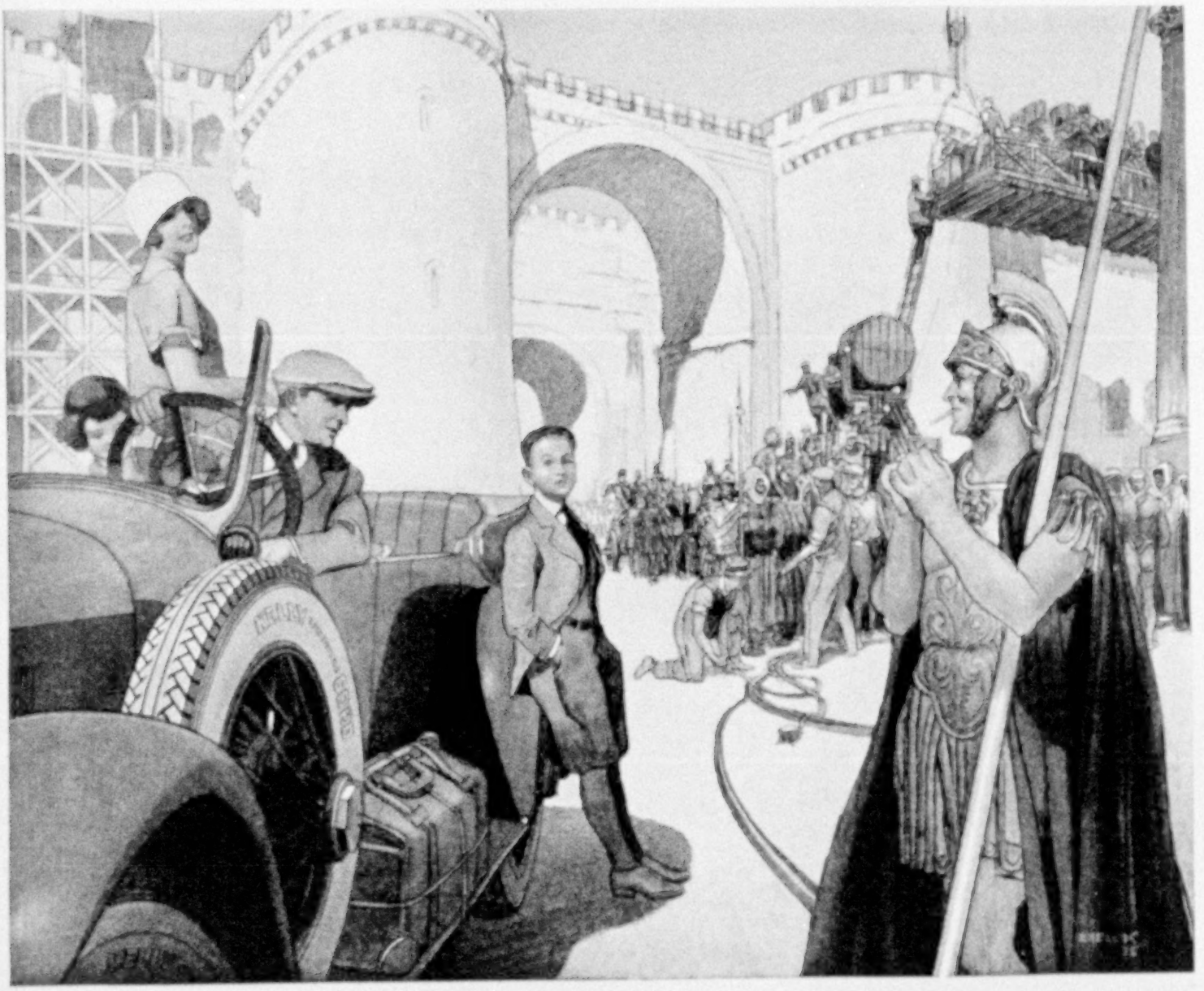
The KELLY FLEXIBLE CORD



The Peregrinations of the Pecks

"Los Angeles" to almost everyone in the United States means the place where motion pictures are made, and of course no trip to the Coast would be complete without a visit to at least one of the studios. By a special dispensation of a film company official who happens to be distantly related to Jim, the Pecks are permitted to see a big scene being "shot." Young Jim is particularly interested in a gigantic Roman centurion, and wonders whether they haven't an extra suit of armor that he could take home.

IN addition to the long, trouble-free mileage that has always been a Kelly-Springfield characteristic, the Kelly Flexible Cord affords the car-owner a degree of riding comfort that he cannot obtain in any other tire of the high pressure type, because its flexibility—the feature that makes this easy riding possible—is due to its Integral Bead construction, used *only* by Kelly.

KELLY-SPRINGFIELD TIRES

Again Packard Pioneers!

PROGRESS based on knowledge has been a Packard characteristic for more than a quarter of a century.

Every five years or so it has been Packard's privilege to make some revolutionary advance for others to follow.

Now, having exhausted present possibilities in power and smoothness, Packard announces improvements of an entirely new nature:

(1) *Ease of routine care.*

(2) *Greater motoring comforts.*

Packard has long known that it has not been enough to design well and to build well. It remained necessary to find some way to protect the workmanship and material built into fine cars.

This has now been done.

The thousands who have taken delivery of new Packard Six and Eight cars during the past few weeks know this to be true.

They have found built into their cars a veritable insurance policy against the undue wear and annoyances that come from lack of lubrication.

They have found the Motor Oil Rectifier and the Chassis Pressure Lubricator, a combination not to be had in any other motor car in all the world.

They have found that motor oil life has been multiplied by five; that they need to change oil but four or five times a year, and that their motors are now almost human in caring for themselves.

They have found that they may lubricate the chassis in less than one second of time, the pull of a plunger forcing oil to the 45 points requiring regular attention

They have found new comfort features; notably an ease of steering and wider and even more luxurious enclosed bodies.

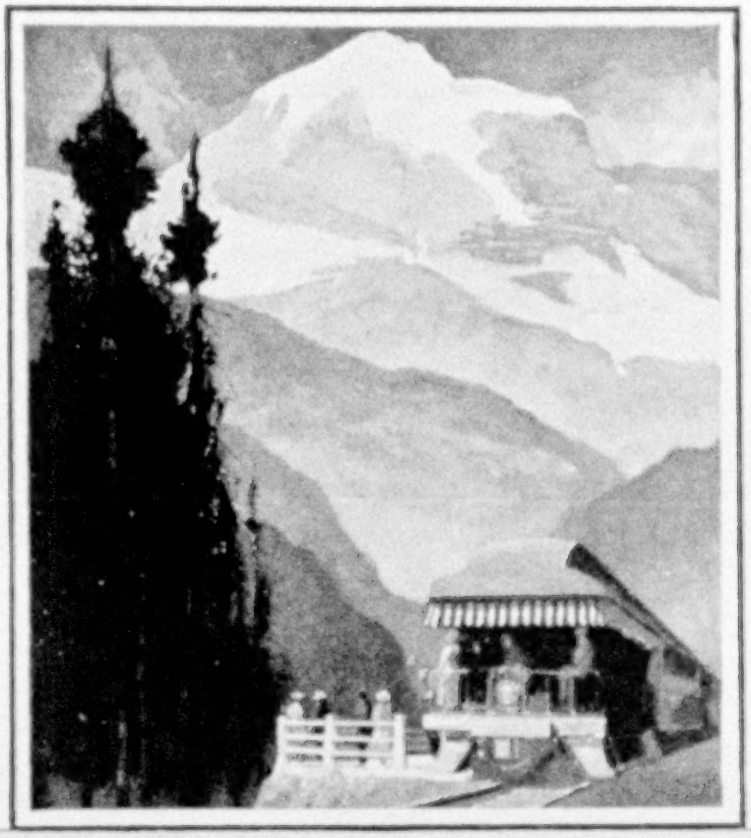
For example, the enclosed models of the Packard Eight have the widest and roomiest bodies offered on any motor car.

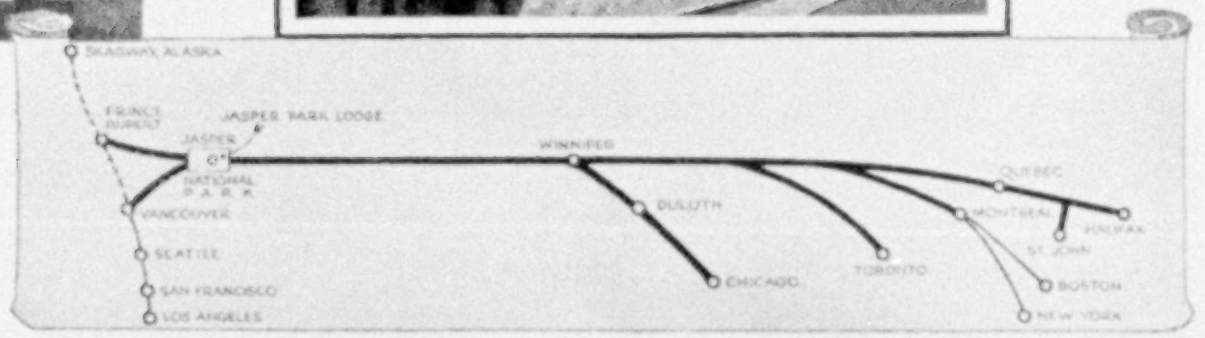
They have found that the utmost in beauty, distinction and comfort is now combined with an easy ability at least to double the mileage life of their Packard cars.

And Packard has found that now, more than ever, Packard should say—

Ask the man who owns one

See Mount Robson—Monarch of the Canadian Rockies on the Triangle Tour





A SHEER rise of two miles from valley to snow-capped peak—Mount Robson is a revelation of mountain magnificence. Splendid views of this highest peak of the Canadian Rockies are obtainable while making the Triangle Tour.

Come to Jasper National Park, with its 4,400 square miles embracing more mountain peaks than any similar area. Here you may climb [with Swiss guide if you like], ride, swim, motor or golf. Jasper Park Lodge provides luxurious accommodations. [Rates $6.00 up, American Plan. Open May 15th to September 30th.]

Here starts the famous Triangle Tour of British Columbia, by rail down the valley of the Mystic Skeena to Prince Rupert, thence by steamer through scenic seas to Vancouver and back to Jasper by rail along roaring gorges.

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You may board a palatial "Canadian National" steamer at Vancouver and voyage in luxurious comfort to Alaska. Returning, disembark at Prince Rupert or Vancouver, as you prefer, and proceed by rail to Jasper National Park, traveling in the midst of majestic mountain beauty. Write to nearest office for tourist fares, resort rates and illustrated booklets.

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Cleveland *948 Union Trust Building*
Detroit *1259 Griswold St.*
Duluth *430 W. Superior St.*
Kansas City *334-336 Railway Exchange Bldg.*
Los Angeles *605 So. Spring St.*
Minneapolis *618 Second Ave. South*
New York *1270 B'way, cor. 33rd St.*
Philadelphia *Franklin Trust Bldg. 1500 Chestnut St.*
Pittsburgh *505 Park Bldg.*
Portland, Me. *Grand Trunk Railway Sta.*
Portland, Ore. *122 Third St.*
St. Louis *306 Merchants Laclede Bldg*
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San Francisco *689 Market St.*
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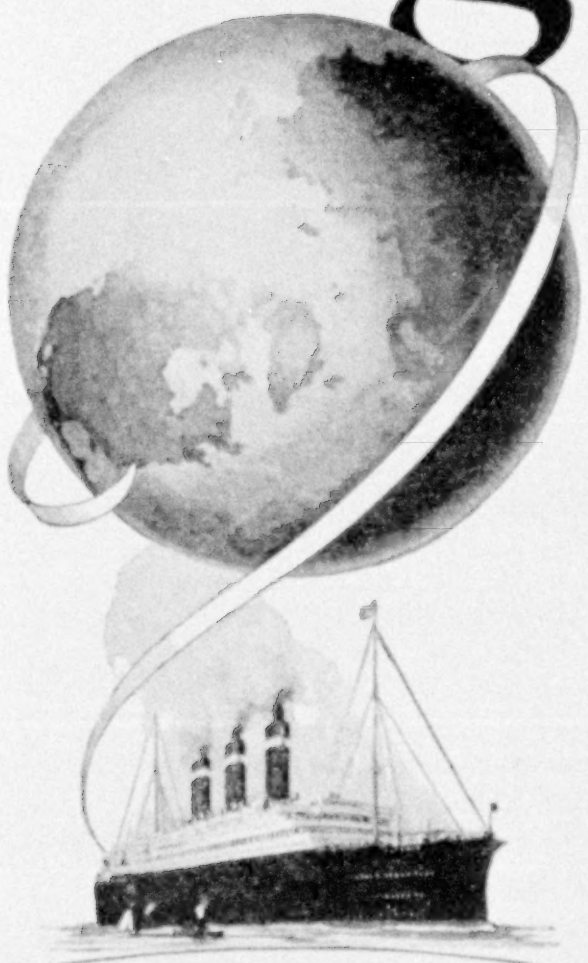

You will enjoy the courtesies that are accorded this outstanding world cruiser whose passengers are received as visitors of note.

You will appreciate the timeliness of the sailing and the skilful arrangement of itinerary which follows the sunshine and brings you to each of the 14 countries at its best travel season.

You will see, most pleasantly, what the wide world has to offer of beauty, of mystery, of contrast in culture and civilization, because of the perfectly arranged shore trips under the guidance of the American Express Company.

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THE DAVEY TREE EXPERT CO., INC., *Reg. U. S. Pat. Off.*
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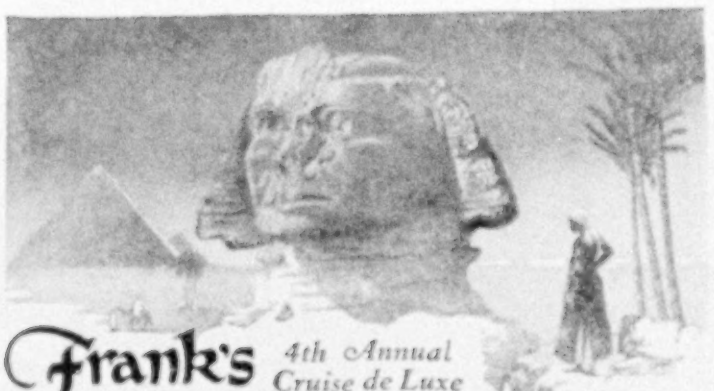
Gentlemen: Without cost or obligation on my part, please have your local representative examine my trees and advise me as to their condition and needs.



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TO THE **Mediterranean**

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By Specially Chartered Magnificent New 20,000-Ton
Cunard S. S. "SCYTHIA"
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The Cruise of the "Scythia" has become an annual classic. In every respect it is unsurpassed.

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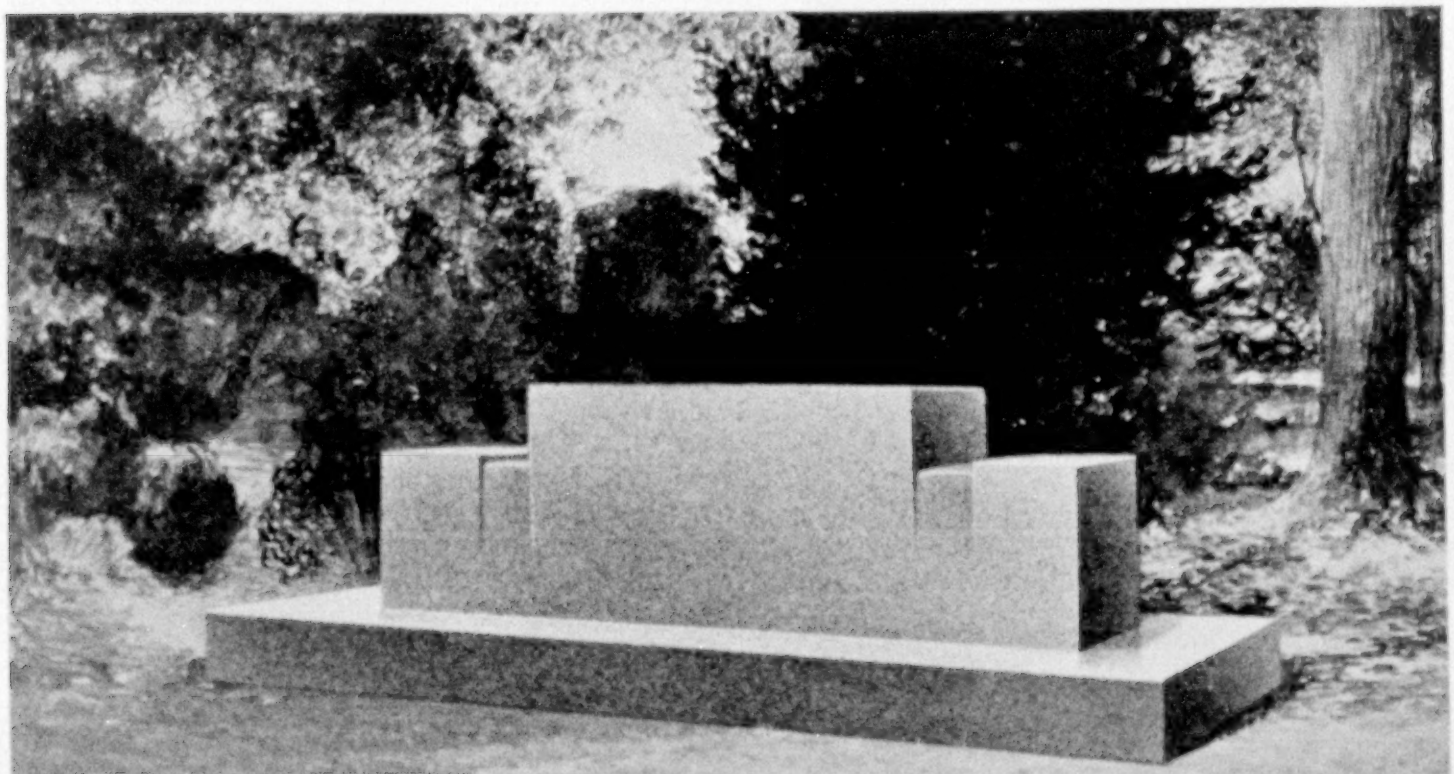

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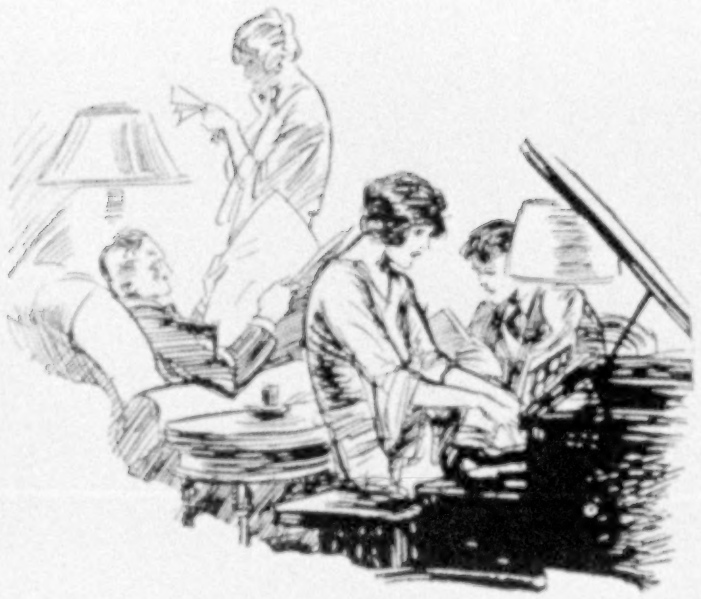

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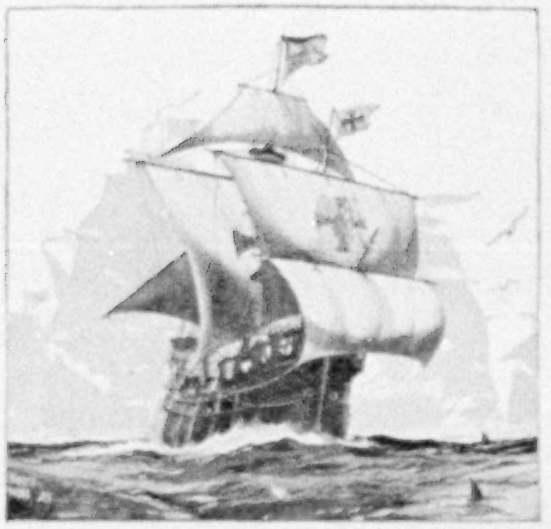

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Day after day, all through the summer, you read the tragic story of death by drowning. Some one dares a beginner to swim out to the raft. Or perhaps the water is too rough. Even the strongest swimmers take unnecessary chances. "Go ahead, be a sport" has brought disaster to thousands.

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There is a vast difference between a sport and a sportsman. The sportsman is courageous and willingly hazards his life for others—but he is not a daredevil.

The sport, showily daring, is the one who does stunts to dazzle onlookers—who dives without knowing the depth or what lies beneath the surface—who swims far out, disregarding unknown currents, undertow and cramps.

Learn to swim—not alone because swimming is joyous recreation and splendid exercise—but so that you can save your own life and the lives of others if called upon. Swimming is not at all a difficult accomplishment. Once learned it cannot be forgotten. Good instructors may be found almost everywhere. It is of highest importance to be well taught.

Your Chance to Save a Life

There is one thing that *everybody*, young and old, should know how to do—revive the apparently drowned. Often they are not dead though life seems to be extinct. Patient, persistent manipulation of the right kind would bring them back to consciousness. It is heartbreaking to think of the lives that could have been saved if some one in the crowd, standing paralyzed with horror, had but known the simple manipulations necessary to rekindle the vital spark.

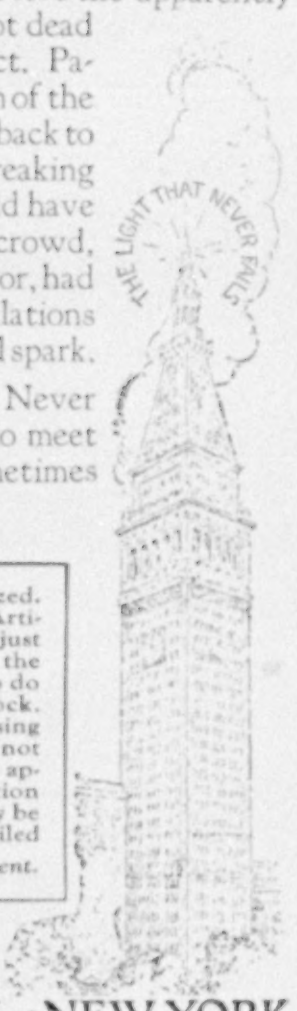
This summer, be prepared. Never court danger but be ready to meet the great hazard that sometimes lurks in water sports.

During the months of July, August and September, deaths from accidents lead all other causes—except heart disease and tuberculosis—among the 22,000,000 policyholders in the Metropolitan Life Insurance Company. Deaths from drowning are at their height during these months.

In July 1924 the number of deaths among Metropolitan policyholders from drowning was about twice as many as from typhoid fever and diphtheria together.

It is the duty of parents to have their children instructed in swimming and the art of resuscitation, so that the danger from drowning attending summer vacations may be minimized. The Metropolitan has prepared a booklet, "Artificial Respiration" which shows by diagrams just how to restore breathing by manipulation of the apparently drowned body, as well as what to do in the case of gas suffocation or electric shock. Carbon monoxide poisoning claims an increasing number of victims each year because it is not generally known that artificial respiration, applied in time, will restore life. The information contained in this booklet is valuable and may be wanted any moment. The booklet will be mailed free. Send for it.

HALEY FISKE, *President.*



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THE NATIONAL GEOGRAPHIC MAGAZINE

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REDISCOVERING THE RHINE

A Trip by Barge from the Sea to the Headwaters of Europe's Storied Stream

BY MELVILLE CHATER

AUTHOR OF "THROUGH THE BACK DOORS OF BELGIUM," "THROUGH THE BACK DOORS OF FRANCE," "ZIGZAGGING THROUGH SICILY," ETC., IN THE NATIONAL GEOGRAPHIC MAGAZINE

"WHY not discover the Rhine?" That was the question my friend put to me as we strolled on the Scheldt-side promenade at Antwerp, watching great barges glide downstream on the first lap of Belgium's water connection with Germany and Switzerland.

I replied that explorers had anticipated us by a couple of thousand years, and my friend retorted, "Sure! But just what do you and I know of the Rhine?" And it must be confessed that, beyond the fact that the Rhine rises in Switzerland and flows into the North Sea, our informational stock was limited to Rhine legends, Rhine castles, the Rhine occupation, and Rhine wine.

It really did seem that, as far as we were concerned, the famous old river stood in need of rediscovery.

That afternoon we started about it. Our first find was a Flemish barge captain lounging aboard his craft, which was propitiously named *Rijn-Schelde*, or Rhine-Scheldt. We informed him of our ambition to ascend the Rhine on a canal boat.

Though obviously a bit puzzled as to why we should prefer that method of travel, he took us to a small inn in the Koeipoortstraate and introduced us to his wife. She was a tired-faced woman, apparently in the worst of humors with her husband. After a moment's colloquy she expressed her willingness to stay behind, this trip, to make room aboard for us.

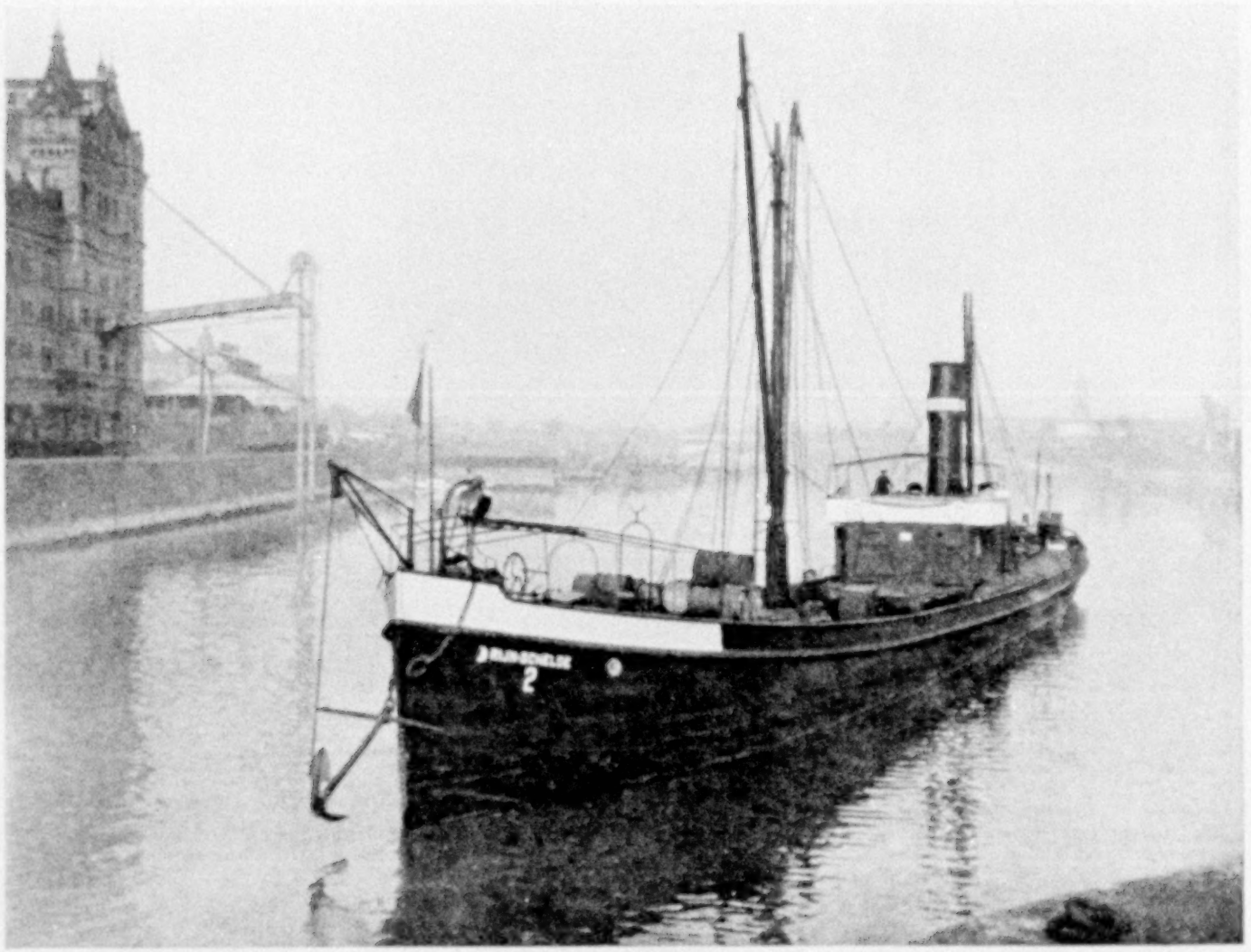
"But the beautiful Rhine scenery, the romantic castles—oh, madame!" we said self-reproachfully, in deprecation of her sacrifice.

"Huh!" madame returned heavily. "I'm going to take a vacation from scenery and castles! I'm going to have a real good time just sitting here and watching folks pass by. You see, I've been going up and down the Rhine in the *Rijn-Schelde* ever since we were married, and that's 12 years."

IN COFFINLIKE BUNKS

That night we groped through a pitch-black labyrinth of quays, boarded the *Rijn-Schelde*, stumbled over her deck cargo of oil barrels, and at length plunged down a steep companionway into the bow cabin. It was trianguloid and measured exactly four paces by three. It contained a miniature cook stove, a table, two chairs, and a pair of what resembled built-in pews. That was all the kerosene lamp's dim light revealed.

"Phew!" ejaculated my friend, after we had economically disposed our persons



Photograph by Melville Chater

THE STEAM BARGE "RIJN-SCHELDE"

On this Flemish craft the author and his companion made a leisurely trip from Antwerp, by way of the Hansweert Canal, to Rotterdam, and thence up the Rhine as far as Strasbourg, at which point they transferred to a boat of lighter draft, which took them to Basel, in Switzerland.

and our single piece of luggage in this closetlike space. "Happy thought, that of yours, our taking only one suitcase. There wouldn't have been room enough for two. And where do we sleep?"

This mystery was solved when the skipper came aboard at midnight. He slid back two panels, thus revealing a couple of small caves, each fitted with a narrow bunk. A spacious gesture indicated that all this was at our disposal.

We undressed, then inserted ourselves into the coffinlike bunks, according to sleeping-car technique. "Hey!" called my friend, "is your Pullman built on a curve?" It certainly was, following the curve of the ship's side; but one soon learned to fall asleep while lying in the shape of a slice of melon.

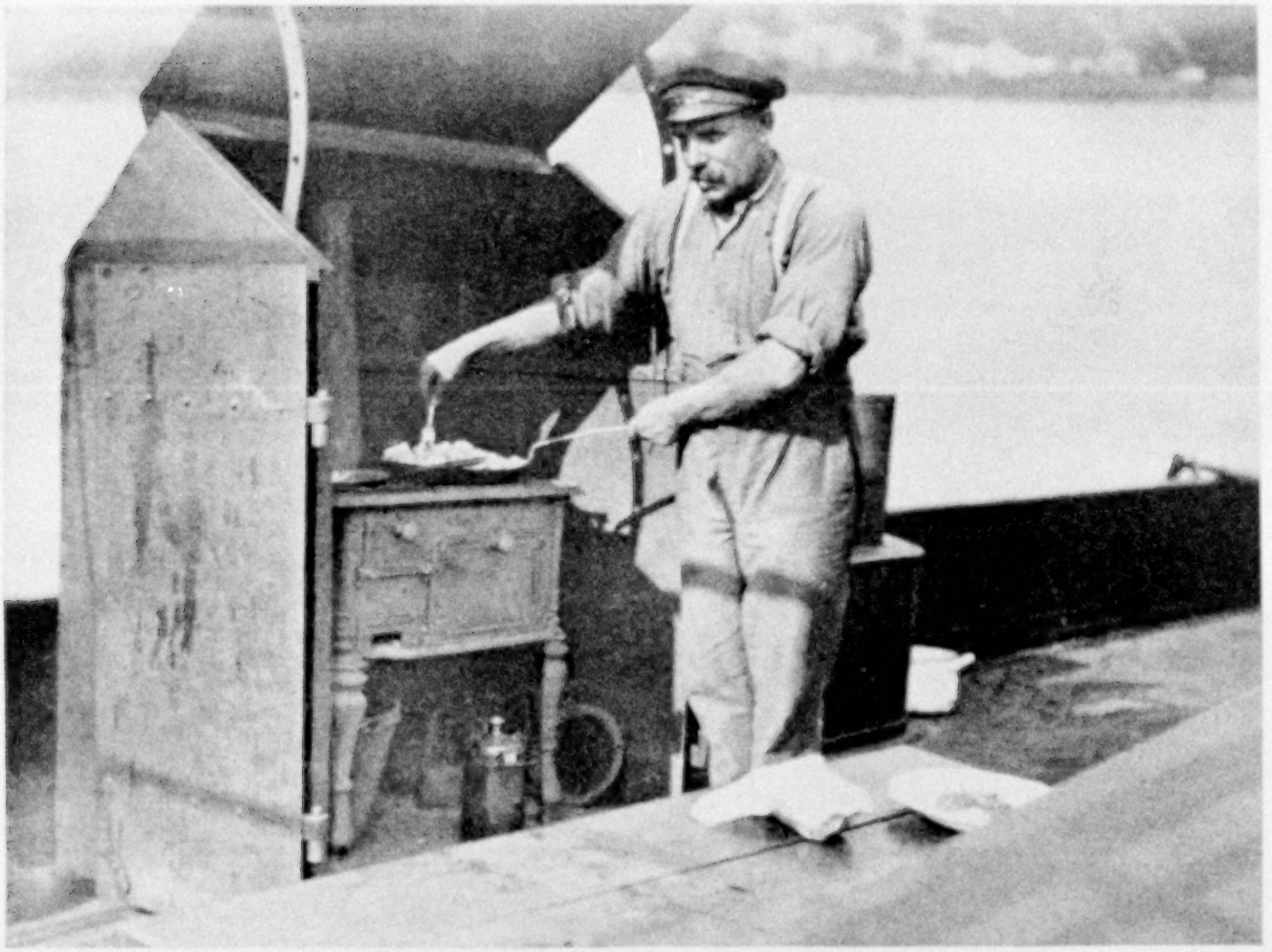
A terrific clatter of anchor chains announced that we were off on the dropping tide. By dawn we had got into our blue jeans, and were on deck to watch the *Rijn-Schelde* pass through the three big locks that divide the maritime section of the Scheldt from the Hansweert Canal.

WE GLIDE THROUGH A CANAL LOCK INTO HOLLAND

It isn't often that a traveler passes from one country to another through a canal lock, yet that is practically what happened as the first pair of great gates closed behind us. And, almost as if it had been staged for our arrival, we beheld a high, green dike where three girls—their black, tight-waisted skirts blown voluminously out behind, their snowy caps uptilted at the corners—walked in single file past a red mill which was churning its sails against the sky.

The sight was so completely typical that we chimed with one accord "Holland!"

A couple of rosy-cheeked Dutch customs officials came aboard, placed seals



Photograph by Melville Chater

DECK COOKING ON THE "RIJN-SCHELDE"

From Antwerp to Strasbourg the skipper of the barge on which the author made his trip was also the cook, as madame, after 12 years of uninterrupted voyaging, wished a vacation from scenery and castles (see text, page 1).

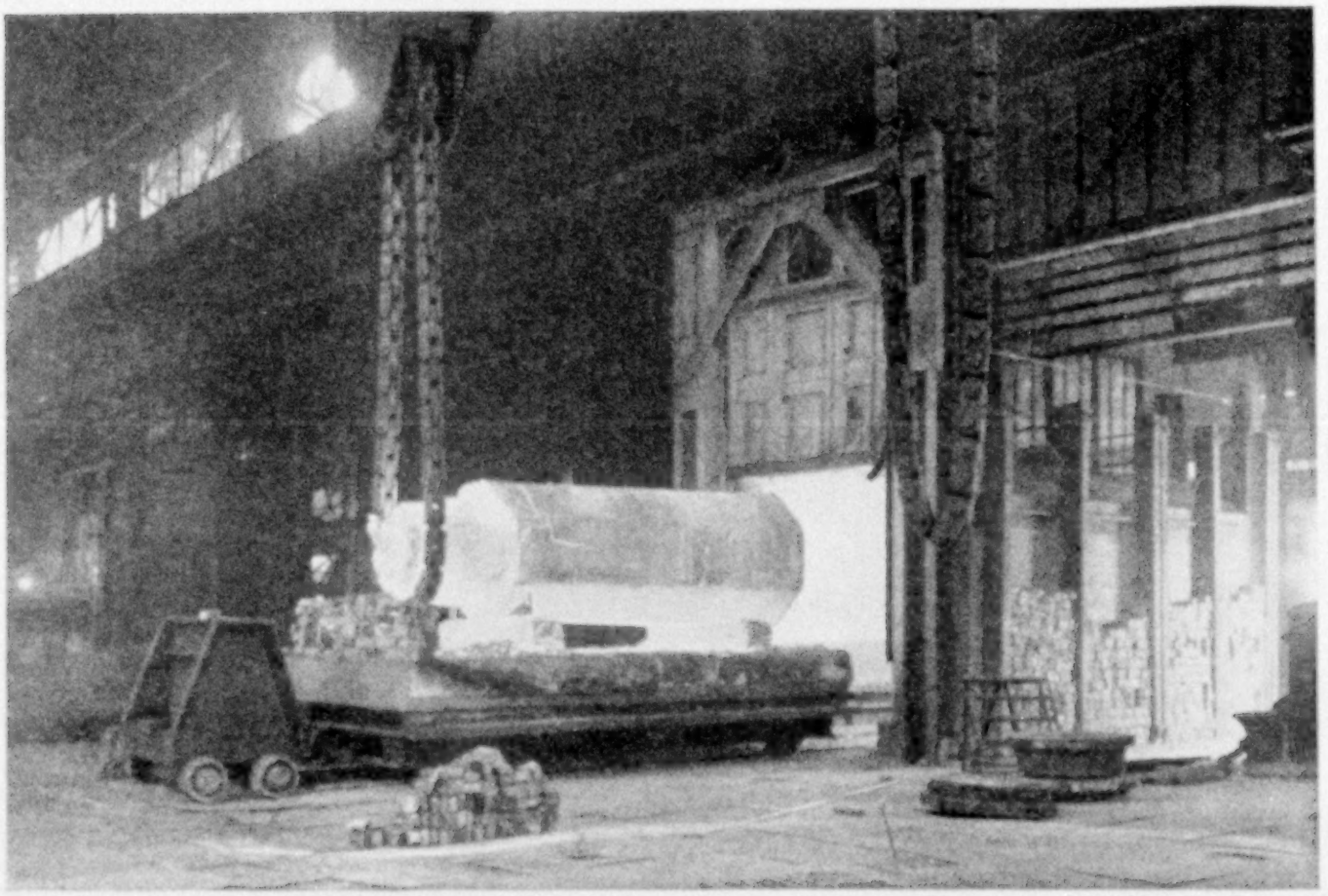
on the *Rijn-Schelde's* cargo, then retired, meanwhile scratching their heads over the mystery of two Americans who apparently enjoyed life among oil barrels on a barge.

The Hansweert Canal, though entirely in Dutch territory, is Belgium's short cut to Rotterdam and the Rhine. Its five miles of length constitute a busy scene of maritime vessels and 2,000-ton barges gliding between flat shores. High, indeed, must be the dikes and powerful the locks of this canal, which cuts across the little island of South Beveland and connects what are practically two arms of the sea.

Another pair of huge locks opened to let us pass out into the lagoonlike Eastern Scheldt. Here the *Rijn-Schelde* sped up to 15 miles an hour, as we coasted among the islands of Tholen, Schouwen, and Beyerland, low and hazy, their files of spectral trees flat against the horizon—a seascape-landscape of gentle grays.

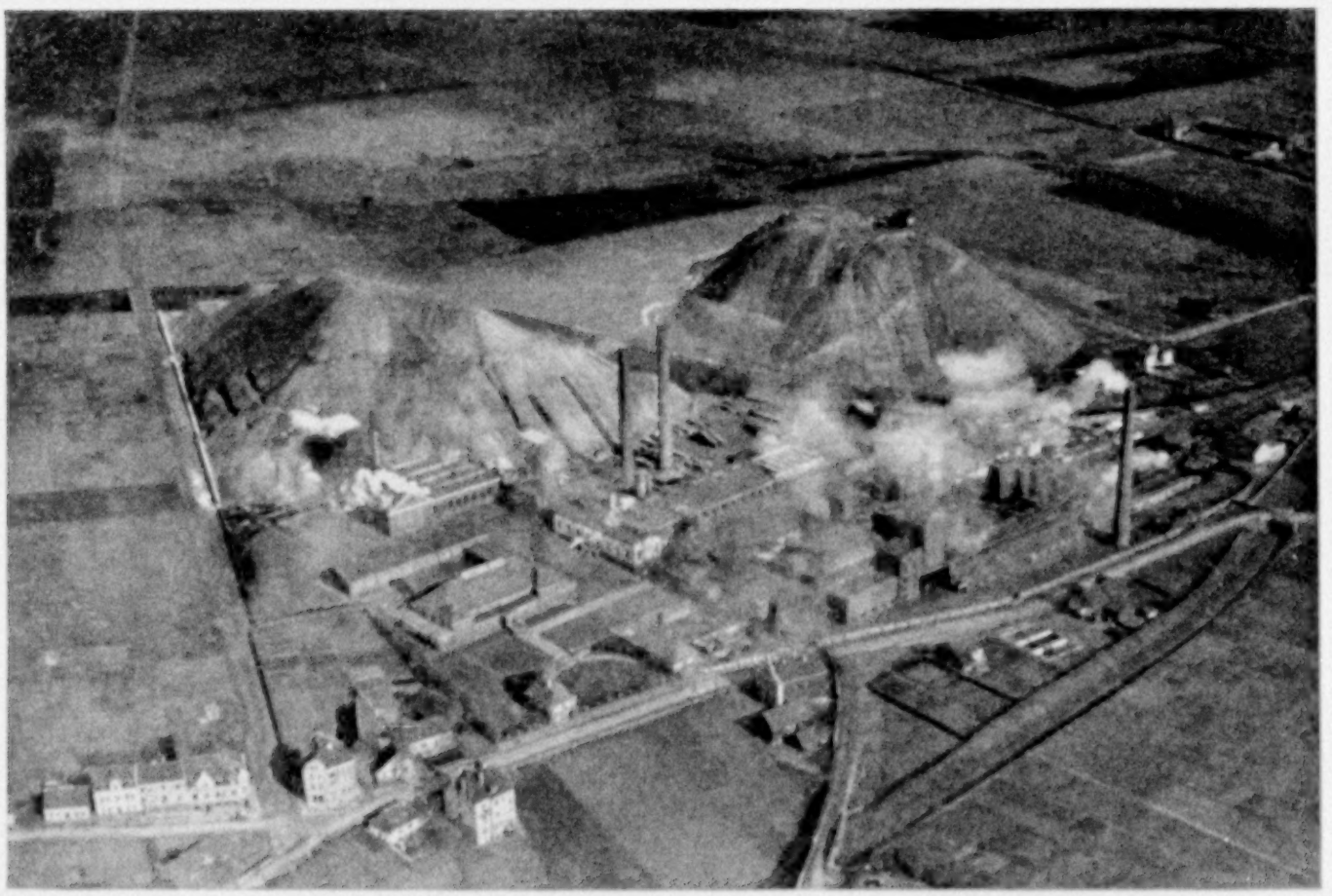
Such is the Dutch province of Zeeland, and never was a geographical name more apt. "Sea-land" consists of seven islands which, as their vast embankments bear witness, have literally been salvaged from the sea. Small wonder that these so-called "drowned lands," which have suffered two great inundations, took as their heraldic device a swimming lion; while as a motto they might well adopt the Dutch proverb, "God made the sea; we made the shore!"

Meanwhile the skipper lighted a fire in the deck stove and boiled some coffee, which grew tepid before he served it. The rest of our first barge breakfast was produced from his hip pocket. At first we took the thing to be a policeman's night-stick. It turned out to be three feet of smoked sausage, but doubtless it



Photograph from Melville Chater

AN INTERIOR VIEW OF ONE OF THE RUHR DISTRICT STEEL WORKS



Photograph by Deutscher Aero Lloyd

LOOKING DOWN UPON ONE OF THE INDUSTRIAL PLANTS IN THE RUHR DISTRICT

Shrouded in smoke by day and lit by furnace flares at night, with whistles screeching as if a great merchant fleet were lost in a fog, this throbbing, teeming district of Germany is the great industrial heart of western Europe.

would have proved a handy weapon in a pinch.

"No woman around to bother us!" he grinned, sawing up the sausage with a clasp knife. "Oh, we'll have a fine trip!"

INVESTIGATING THE SOURCES OF TWO RHINE LEGENDS

Flat Dutch landscape — green meadows, spotted cattle, and red windmills, neatly "composed," as painters say, into ready-made pictures — accompanied us all that day. Toward sunset we anchored at Lobith, the last village before crossing the German frontier.

The local shops were full of barge skippers, laying in supplies for the long Rhine trip. Among them we recognized our man, who, to our dismay, was acquiring many lengths of hard, smoked sausage.

Then all hands withdrew to a near-by café. Here, unlike the landlubbers, who were swallowing small, fiery drams of schnapps in quick succession, the skippers yarned for an hour over a glass apiece of sweetish beer, then returned aboard.

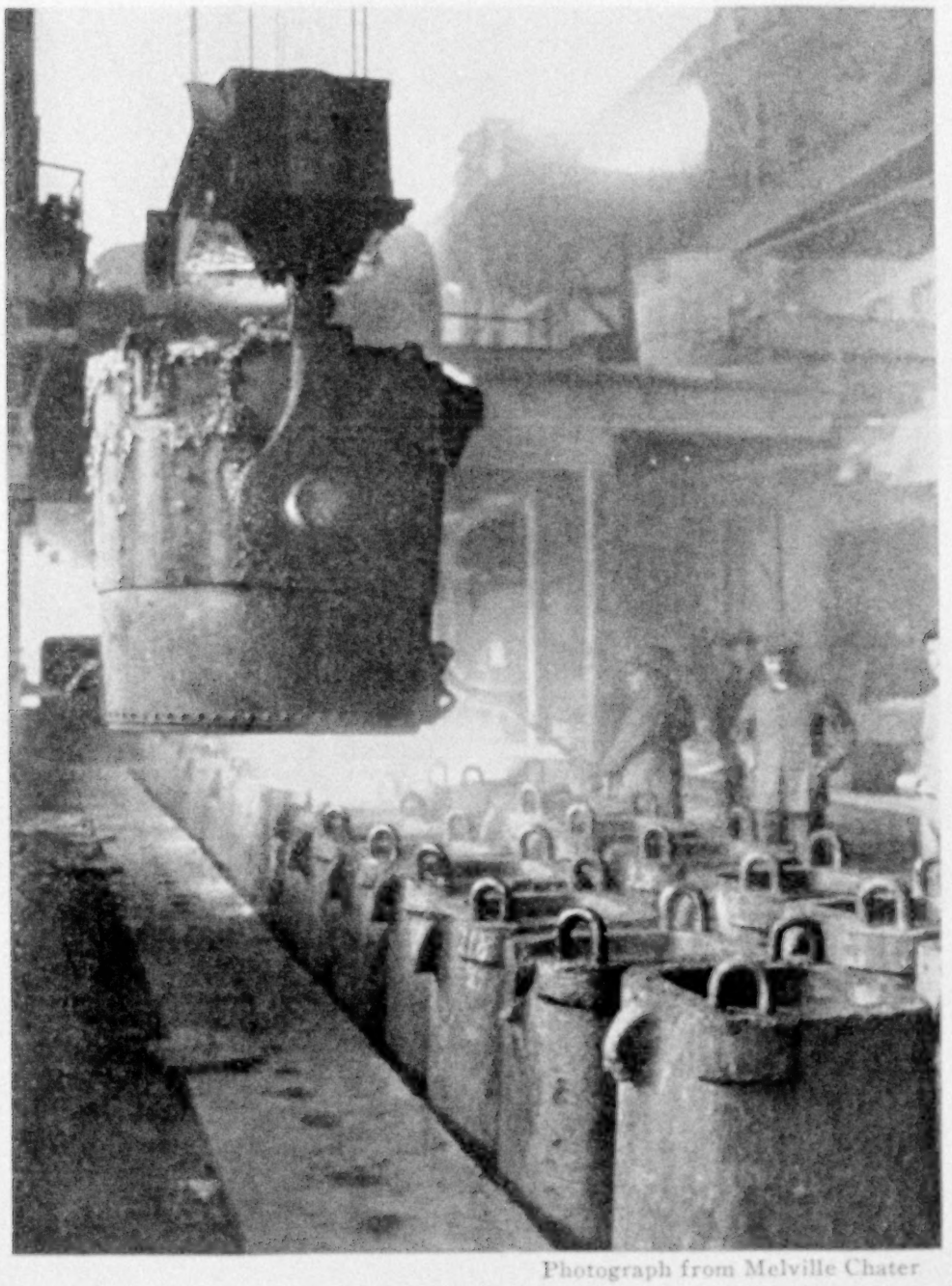
In bed by nine, up by five, and a day of endless responsibility on a difficult and often crowded stream—such is the life of the average barge skipper on the Rhine.

At Emmerich, where the German officials came aboard next morning, a day's delay enabled us to visit the sources of two Rhine legends.

At near-by Cleve we paid homage to Lohengrin's monument; for here, says tradition, came the mysterious, swan-drawn knight to rescue Elsa from the toils of the usurping Telramund; and from here he departed as mysteriously, via the same Rhine swan service, to furnish an opera libretto for Richard Wagner.

The other legend source was at the quaint little town of Xanten. Here is the putative birthplace of Siegfried, the hero of the "Nibelungenlied" epic, and, incidentally, one of the first Rhine tourists. At the age of 13, Siegfried got that "See-Germany-First" impulse and started upstream on his Rhine exploits.

With the exception of a trip to Iceland, where he captured and captivated the fire-surrounded Brunhild, all his legendary adventures took place in the Rhineland, between Xanten and Worms, a distance of about 200 miles.



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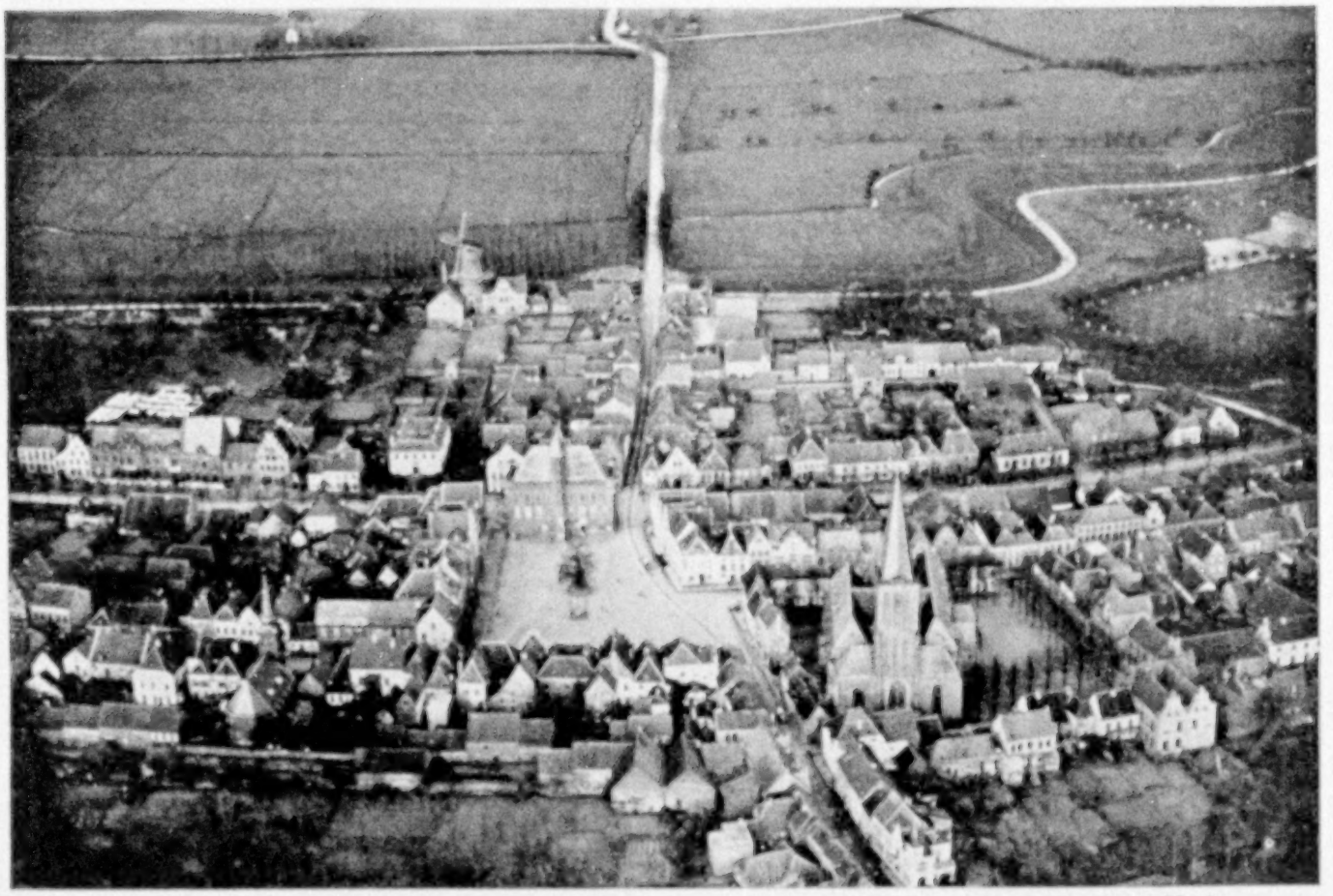
PART OF THE STEEL WORKS OF THE DORTMUND UNION, DORTMUND, EAST OF ESSEN



Photograph © Kadel and Herbert

CALCAR, ON THE LOWER RHINE

This small town, northwest of Essen, is one of the most picturesque spots of Germany. In the 15th century it was the seat of a famous school of wood carving, and its Gothic cathedral is a veritable museum of this art. In the center of the market place (central foreground) is a statue of the Prussian general Seydlitz, the famous cavalry officer whose superb horsemanship has given rise to many stories, one of which relates that he once rode between the sails of a windmill in full swing. But Calcar does not claim that it was the windmill shown in the background of this photograph.

Early next morning the *Rijn-Schelde* was under way, headed for the Ruhr district. All day long its proximity was evidenced by the passage of barges, banked high with coal, for France and Belgium. During that week 444,000 tons of reparations coal moved from the mines.

THE RUHR DISTRICT SEETHES WITH INDUSTRY

We passed through much of the Ruhr after dark, and thereby perhaps had the most striking view of it. The light of the upleaping flares from its blast furnaces from time to time momentarily threw into relief that vast labyrinth of wharves, stacks, mills, railway tracks, and pit heads, where labor more than 2,000,000 men.

Oberhausen, Essen, Rheinhausen, Duisburg, Ruhrort, Meiderich—these industrial centers follow so closely upon each other as to produce one colossal effect. The last three compose, in fact, one community, whose combined water fronts form what is probably the largest river harbor in the world.

The Ruhr district produces per year about 6,000,000 tons of pig iron and from 4,000,000 to 5,000,000 tons of steel. During 1924 its average monthly yield of coal was 8,000,000 metric tons. The five big groups of iron and steel manufacturers employ about 1,500,000 men, while the coal workers number about 550,000.*

The ancient compilers of the "Nibelungenlied," who fabled the Rhine underworld as alive with metal-working gnomes, would indeed rub their eyes could they behold how completely man's works on the Ruhr have dwarfed their poetic imaginings.

* See also "The Story of the Ruhr," by Frederick Simpich, in the NATIONAL GEOGRAPHIC MAGAZINE for May, 1922.

Photograph from Ernest Peterffy

PLANTING POTATOES IN THE RHINE VALLEY

Many German girls now find it necessary to improve their fortunes by farming.

Quite a different spectacle awaited us farther along, where Cologne's great cathedral spires towered over the Rhine like two fingers pointing the surrounding city to heaven (see page 8).

Whether by reason of its superb position or its commanding loveliness, Cologne minster dominates its city almost overwhelmingly. One comes to regard it as some gorgeous Gothic flower, and the town as merely the nourishing soil which brought it forth.

IN THE SHADOW OF COLOGNE'S CATHEDRAL SPIRES

Radiating from the cathedral extend the tree-lined boulevards which, 50 years ago, arose out of Cologne the old, the crooked-alleyed, whose tumble-down city walls were then razed to comport with the dignity of this great Rhine port.

But whatever route one may take, whether through the fashionable shopping quarter or down through the few remaining alleys of gabled house fronts, the cathedral's twin spires beckon one to return.

And time and again one does return, to wander, antlike, through those great, dim spaces where groves of columns rise through an eternal twilight. Far overhead the outflung files of stained glass gleam like a belt of sparkling jewels, while higher still are panes which infiltrate a pale-blue light.

It is as if the cathedral's interior were meant to typify a dark world down into which the radiance of heaven is always shining from afar (see page 11).

Surprisingly, this masterpiece of Gothic architecture is in large part modern. It was begun in 1248 and languished for six centuries; then a fresh start was made in 1842. Legend relates that the original architect, Meister Gerhard von Rile, sold his soul to the Evil One, perished along with his plans, and continued to haunt the unfinished edifice until its completion, in 1863.

COLOGNE'S HISTORY GOES BACK TO ROMAN TIMES

"This is a voyage of discovery," my friend reminded me. "I'm not going to leave Cologne until I've found out whether the city was named after the

Photograph by Hermann Jansen

COLOGNE FROM THE AIR

The famous *Dom* overshadows this historic Rhine port, which was founded in 38 B. C. It is the center of the Rhenish trade and one of the most important commercial cities of Germany. To the left of the cathedral (see, also, page 10) is the Central Railway Station, and in the distance is the Hohenzollern Bridge. Deutz lies on the opposite bank of the Rhine.

perfume or the perfume after the city." So we unbared our ignorance to the local archivist.

He explained that Cologne originally meant "colony," or more specifically, Colonia Claudia Ara Agrippinensis, and that Rome had made it the administrative seat of her holdings in lower Germany. He even showed us a natural elevation, still discernible in the city's midst, where the Roman legions had once been encamped. Their general, Marcus Vipsanius Agrippa, started constructing for drainage and water-supply. That the work was quite up to standard may be proved by anyone who cares to inspect Cologne's underground tunnel, known as the Römergang.

As for the 77-kilometer conduit, the city's supply pipes follow the same line to-day.

After some four centuries of Roman occupation, the Germanic tribes threw off the yoke, and what had been known as the Colony gradually became known as Cologne.

By the Middle Ages it had become the home of ecclesiastical and lay art, and by the 14th century it had risen to a commercial prominence which has characterized the city down to to-day.

Modern Cologne is the port of registry for Rhine-to-the-sea traffic and the gateway of cargoes destined for North Sea ports, the Baltic, and the Neva.

Throughout Germany the civic authorities make monthly estimates of living costs. During our stay at Cologne the irreducible minimum for a family of four for the month of September, 1924, was computed at 168 gold marks, or about $40. This represents an advance of 130 per cent over living costs in 1913.

BEETHOVEN'S DEATH MASK AND THE NEANDERTHAL SKULL

For a day my companion and I wandered about the quaint streets of near-by Bonn, in and out of its famous university, and along its Rhine esplanade. We separated for awhile, and when we met again my friend announced:

"There's only one important thing in Bonn. A musical student just now told me so. He said not to bother about the museum, but to see Beethoven's death mask."

"Yes," I countered, "according to an anthropologist I met in the university, there *is* only one important thing. He said not to bother about Beethoven's death mask, but to see the Neanderthal skull in the museum."

So we saw both.

The mask is enshrined in the little house where, in a mere garret whose door lintel is so low that one must stoop to enter, the great composer was born in 1770.

Among the adjacent Beethoviana you may see the tragic progression of ear trumpets, each one larger than the preceding, whereby the master sought in vain to circumvent deafness; the many manuscripts, including that of the "Moonlight Sonata," written in hastily jotted notes and headed by the direction, "With feeling," written in emotionally tremulous handwriting.

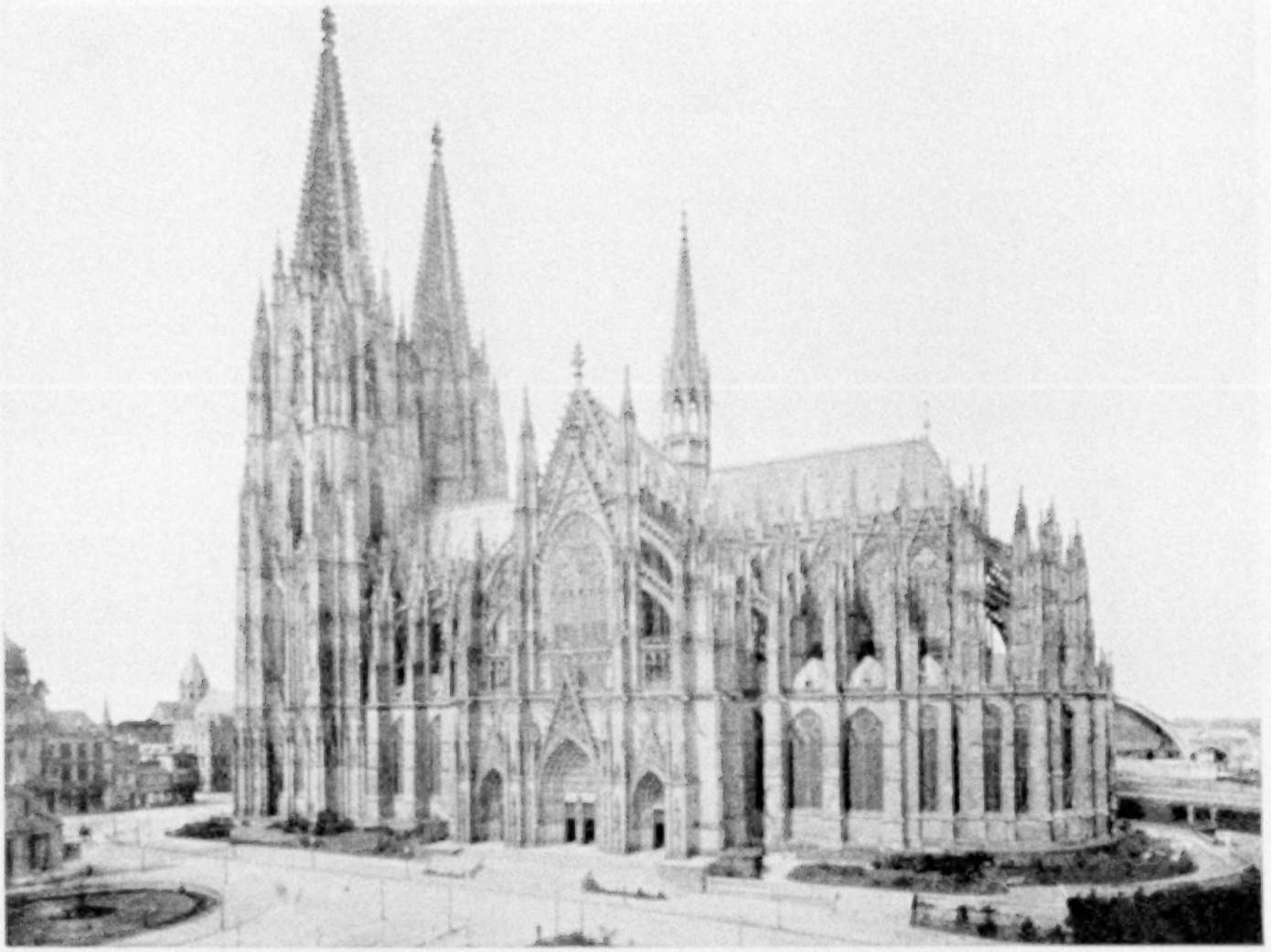
And there is the death mask—a face as noble as its brow is broad, a face stamped with human kindliness, sad to the depths yet serene to the heights—an epitome of man's mental struggle upward.

Twenty minutes away, across the town, in a museum case environed by an exhibit of stone hatchets and spearheads, lay the skull of one of the earliest-known men, he of the Neander Thal, near Düsseldorf. In that big cranial expanse, protruding into heavy ridges at the brows, there is something almost terrifying. One imagines the complement of a semigorilla face, with bared teeth tearing at raw meat.

In twenty minutes we had spanned millenniums of human evolution, with all its mystery; for no craniological measurements could explain why the Neanderthal man's utmost invention was a flint weapon, while back of Beethoven's brow lay the "Moonlight Sonata."

That night we bade good-bye to Cologne's restaurant life and returned to the *Rijn-Schelde* and the captain's deck cooking.

Certainly his was the skimpiest kitchen outfit afloat. But we rather suspected madame of having hid most of the pots and pans, just to show him that getting along without a woman aboard wasn't so easy. Though smoked sausage, chilly coffee, and very plain cooking on *briquettes* comprised his efforts, he was be-



Photograph from Melville Chater

THE COLOGNE CATHEDRAL, THE FINEST GOTHIC EDIFICE IN GERMANY

The cornerstone of this architectural masterpiece was laid in 1248; its completion was celebrated in 1880. The twin towers are 515 feet high. The largest of the bells in the south tower weighs 27 tons, and formerly it took 28 bell-ringers to set it in motion.

ginning to chafe under domestic routine, especially whenever we delayed him by taking sponge baths from the bucket into which he peeled potatoes.

THREE BILLION TONS OF LIGNITE IN ONE SEAM

The briquette industry, by the way, we had "discovered" not far from Cologne. An imposing amount of lignite is machine-pressed into these handy fuel balls, the Rhineland's 72 lignite mines and coöperating plants having produced 7,000,000 tons of briquettes in 1923.

The presence of 60 per cent of water in German lignite and the impossibility of transporting without breakage hand-pressed fuel balls held back the industry until 1870, when the invention of a pressing-machine yielded cheap, firm briquettes of high heating power.

The great lignite seam southwest of Cologne measures 24 miles long by 3 miles broad, and contains, certainly, three billion tons. Throughout the Rhineland 24,000 men work in the lignite mines.

On leaving Cologne we had taken aboard two kayaks and their owners, a couple of young Germans who, with baggage strictly limited to a towel, a cake of soap, and two bottles of Rhine wine, proposed to ascend with us as far as Bingen, then paddle downstream.

Had we feared lest Rhine romance and legend had suffered eclipse in post-war Germany, the enthusiasm of those two youths would have reassured us.

LEGEND CLINGS LIKE IVY TO RHINE RUINS

At Rolandseck they sang a ballad at the remains of the castle where Roland died upon returning from the Crusades to find that his Hildegunde had entered a convent; and all along the winding stretch that leads to Coblenz they trolled the appropriate ballad as we breasted each ruin,

Photograph from Melville Chater

INTERIOR OF THE COLOGNE CATHEDRAL

"Far overhead the outflung files of stained glass gleam like a belt of sparkling jewels. . . . It is as if the cathedral's interior were meant to typify a dark world down into which the radiance of heaven is always shining from afar" (see text, page 7).

and cried out, *"Schr schön!"* at every newly revealed vista.

Rhine legend is a good deal like the ivy that beautifies many a Rhine ruin, which, lacking the legend, would often be overlooked in favor of the river's ever-changing magnificence.

For a day the craggy heights continued, now lapsing horizonward, now reassembling along the banks, as if in successive efforts to choke the Rhine. And, bend after bend, we sighted red-roofed, slope-set towns. Each had its neat quay, its water-side inn, an ideal route for motor car or motor boat, jealously guarded from the encroachment of factory chimneys and advertising signs.

A momentary flattening of the banks showed us Neuwied, the home of the Moravian Brothers' self-governing settlement and once the school town of George Meredith, who later novelized his German experiences in "Harry Richmond."

Then up shot the left-hand bank, culminating in the fortress of Ehrenbreitstein. Opposite, wedged in triangularly at the confluence of the Rhine and the Moselle, lay Coblenz (see illustrations, pages 14 and 15).

THE STARS AND STRIPES FLEW OVER AMERICAN FORCES AT EHRENBREITSTEIN

Confluentes, the Romans called the place. It has always been an important military stronghold, from the far-off days down to the occupation following the World War, when from early in December, 1918, to January 24, 1923, the Stars and Stripes flew from Ehrenbreitstein. The American forces, at their peak of strength, totaled 10,426 officers and 251,833 men.

We docked on the Moselle frontage near a flotilla of barges loaded with locally made sparkling wine. Then we

© Donald McLeish

THE FORTRESS OF EHRENBREITSTEIN, CALLED THE GIBRALTAR OF THE RHINE

This stronghold, across the Rhine from Coblenz (see page 11), crowns a knoll which rises to a height of 385 feet above the river. It occupies the site of a historic fort which played an important part in the Thirty Years' War. The Stars and Stripes flew from Ehrenbreitstein from December, 1918, to January, 1923 (see text, page 11).

XUM

Photograph from Ernest Peterffy

THE WOMAN WITH THE HOE PRESENTS NO SUCH FORLORN ASPECT AS THE MAN WITH THAT IMPLEMENT DEPICTED BY MILLET

The farms of the Rhine Valley have profited since the World War by the influx of such industrious young women.

FRENCH TROOPS PASSING OVER A BRIDGE AT COBLENZ, ON THE RHINE

found our way through some sleepy, old-world courtyards to the town's center.

In the doorway of a shop whose window displayed American cigarettes stood the proprietor, watching a review of French troops in an adjoining square. "No," we heard him mutter in accents unmistakably American, "'taint like what it useter be."

He was, to use his own words, "the last American left in Coblenz," and signified his delight at meeting two fellow-countrymen by piloting us over the town. We strolled along the Rhine Promenade, across the interesting Bridge-of-Boats, up Ehrenbreitstein's steep cliff and down again. Now and then he would half-soliloquize, "No, Coblenz ain't like what it useter be."

He had come with the Army of Occupation, liked the town, had stayed on and married. The American troops had gone out and the French had taken their place.

At parting he forced upon us cartons and cartons of American cigarettes, and said: "If you ever get to Jonesville, see the folks an' tell 'em I'm O. K. Oh, Coblenz is all right, and the 'frawgs' are good customers of mine, but—" (his eye wistfully followed two *poilus* walking with their girls) "well, you get me, 'tain't like what it useter be."

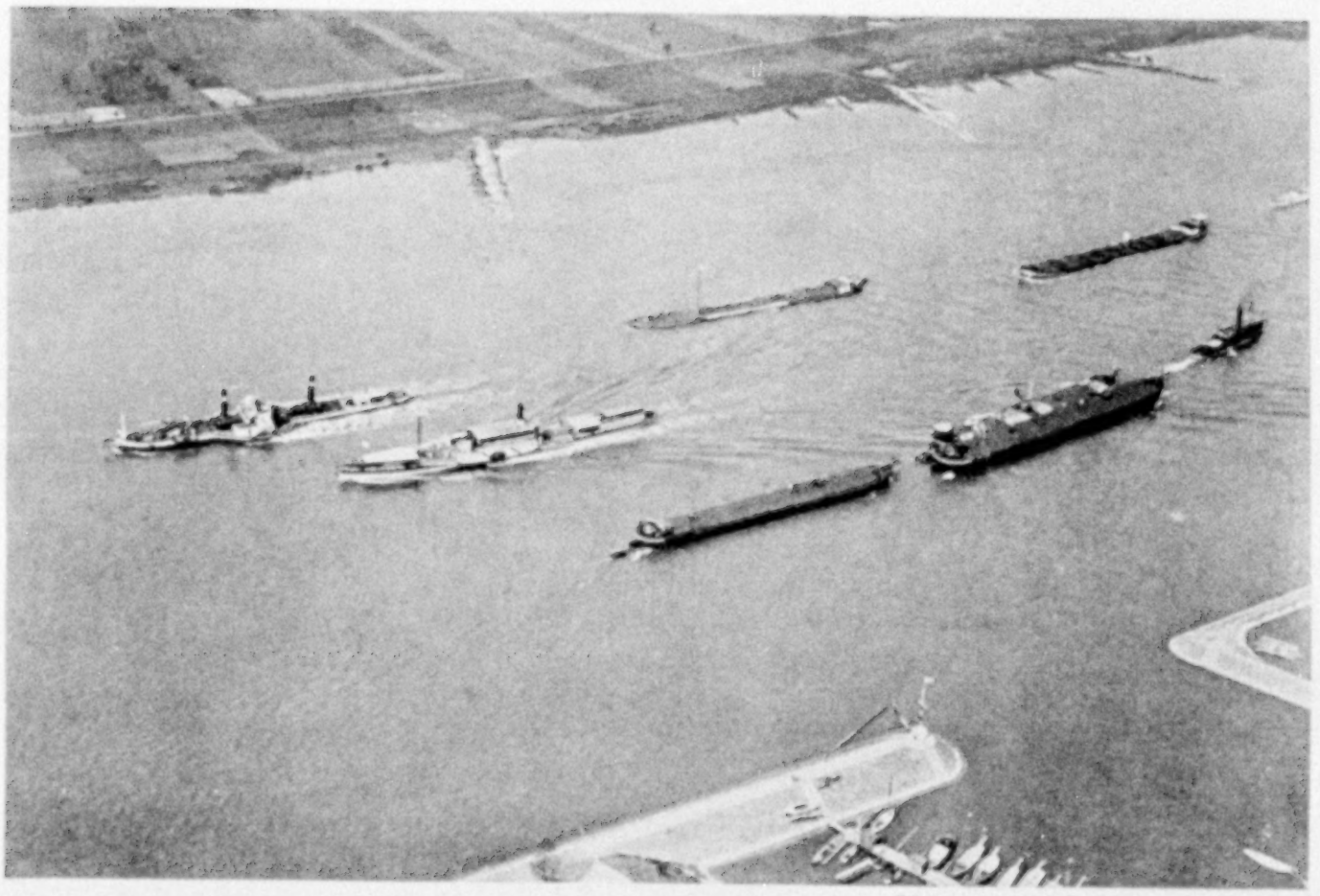
CHEERY LITTLE RHENS: "THE HANS SACHS TOWN"

Just beyond Coblenz we visited cheery little Rhens. With its single street of half-timbered house frontages painted over with drinking scenes, its carved gnomes and dogs upholding the door lintels, its swing signs announcing So-and-So, the "master builder" or "master tailor," Rhens seems less like a living town than like a stage setting for a market-place act of German opera.

In starched decorum, their fingers marking the place in their prayer books, Rhens' little population trooped past to church, inevitably suggesting an opera chorus. Two old men issued from under a swing sign marked "1600 A. D." to gossip across their long-stemmed pipes. They might well have been discussing some forthcoming song tourney, and a certain master cobbler who was likely to prove "meistersänger."

And so, in honor of Wagner's opera, we christened Rhens "the Hans Sachs town."

We rejoined the *Rijn-Schelde* at Co-



Photograph by Dr. Franz Stoedtner

BARGES AND RHINE STEAMERS AT COBLENZ

It was here that American troops were stationed after the World War. The last doughboy was not withdrawn until January 24, 1923.

blenz for another day's ascent of the river's magnificent, canyonlike course.

But Rhine folk do not permit perpendicular scenery to interfere with the business of grape-growing. From Bonn to Mainz we beheld an almost continuous vista of the vine—armies of grape-hung stakes rising on cliffs' flanks and in the valleys between—a riverside vineyard 90 miles long (see illustrations, pages 18, 23, and 25).

And plentiful as grape leaves were the Rhine legends rehearsed by our two fellow voyagers. That of the German knight who goes off to the Crusades, returning to find his ladylove dead, is the stock explanation for many a supposedly haunted Rhine castle.

THE LOCOMOTIVE'S WHISTLE HAS SUPPLANTED THE LORELEI'S SONG

The legend of Rheinfels, almost opposite the Lurlei (Lorelei), makes the departing knight plant a linden tree whose flourishing or decay would magically indicate the state of his health. In his absence a rival for his mistress' hand secretly replaces the growing tree with a withered one, thereby causing the lady to commit suicide.

Passing the Lurlei, our fellow travelers burst into Heine's lines, "Ich weiss nicht was soll es bedeuten," while we two Americans speculated as to whether the nymph's siren song, to have reached mariners passing 430 feet below her cliff, had been transmitted by megaphone.

Poor Lorelei! Her song has been supplanted by the locomotive's shriek, and her classic rock has been tunneled by unholy railway engineers. But no trace of the Nibelungen hoard supposed to have been sunk there, according to the legend of the "Rheingold," has ever been found.

But these sacrileges are as nothing compared with the proposal of an American radio fan encountered at Mainz. He said:

"Why not capitalize the Lurlei's centuries of publicity by installing a broadcasting station on top of the rock? Vocal programs, of course, drinking songs advertising German wines, anvil choruses advertising German cutlery, cradle songs

SCHLOSS ELTZ, ONE OF THE BEST PRESERVED MEDIEVAL CASTLES IN EUROPE

This famous landmark, which dates back to the 12th century and has never suffered destruction or restoration, is situated on a lofty rock some 20 miles up the Moselle River from Coblenz. It is the ancestral home of the Counts of Eltz.

WHERE SIREN SONGS FORMERLY LURED SKIPPERS TO DESTRUCTION

On the right bank of the Rhine, a few miles south of Coblenz, rise the imposing rocks which, according to the fairy tale, were the dwelling place of the Lorelei (Lurlei), made famous by Heine's beautiful ballad (see text, page 15).

advertising German house furniture; and a big signboard on the front, running, 'Lorelei Broadcasting Company. Tune in on station LORE to-night!"

Nearing Bingen we passed the little towns of Oberwesel and Bacharach, surely two of the quaintest old-world spots on the middle Rhine. Sleepily they regard their river reflections from behind 14th-century walls and towers, Oberwesel's tiny market place centered by a 12-foot cross bearing the effigy of Christ crucified, and Bacharach with its tradition of an effigy of quite another kind.

Supposedly the latter derives its name from Bacchus, and until very recent years its natives continued the local custom of dressing up a straw man, throning it on a certain rock—some say it was originally a Bacchic altar—and singing around it.

HISTORY PUNCTURES THE LEGEND OF THE WICKED BISHOP EATEN BY RATS

Ahead, amid swift rapids, the remaining indications of long-impassable reefs blown up a century ago, rose the Mouse Tower (see page 23).

Having been brought up in the belief that the wicked grain profiteer of the 10th century, Bishop Hatto, was devoured here by rats, we were considerably dashed to learn from our fellow travelers that

Photograph from Ernest Peterffy

A SEMINARY ON WHEELS

These young German women are studying the science of farming. Perhaps they will eventually receive the degree of bachelormaid of agriculture.

Photograph by G. S. Urff

THE ORIGIN OF RHINE WINE

Young and old are gathering the grapes on a terraced hillside.

Photograph from Ernest Peterffy

A GOAT GIRL

In western and southwestern Germany, small estates and peasant proprietors predominate, while large estates are found chiefly to the northeast. According to the most recent livestock census, the Republic has more than 4,000,000 goats, a figure considerably in excess of the number of horses.

Musturm originally meant "arsenal," and not mouse tower, and that the tale of the bishop-eating rodents was first circulated four centuries after Hatto's death.

They made amends for our disappointment by recounting a legend of the Nahe River, whose confluence with the Rhine we breasted just outside of Bingen. The local count once bet Sir Boos of Waldeck a village that he couldn't quaff a hip boot filled with wine. Whereupon the latter quaffed the fill of both his boots and demanded the delivery of two villages.

"And now for Bingen!" said my friend anticipatively. It came in sight, a smallish, hill-set town, simple and sweet, in the evening glow (see pages 24 and 25).

"What, is *that* all?" he exclaimed in a defrauded tone. "Why, Bingen is world famous on account of that poem. I thought"——

Whatever he may have expected, I found the town's sweet intimacy just the right background for the ballad.

"A soldier of the Legion—dying at Algiers—lack of woman's nursing, dearth of woman's tears—for I was born at Bingen, at Bingen on the Rhine." These snatches of the classic recitation, delivered in German, came to us from one of our fellow voyagers.

Photograph by G. S. Urff

A FISHERMAN ON GUARD: WAITING FOR SALMON

The fisherman sits at an opening in his boat, holding the cords of the net in his hands. Experience has taught him to feel it immediately when a salmon, on rising in the stream, collides with the net. When this occurs he quickly pulls the cords from a lever, and poles tip over, drawing the net upward and catching the fish (see page 21).

Next morning our German friends paddled off in their canoes. A few hours later we were anchored near the broad esplanade at Mainz.

MAINZ NOURISHED FOLK BALLADS AND EARLY PRINTING EXPERIMENTS

The city is almost entirely modern, save for the cathedral and its surrounding market place, a scene which probably looks much as it did in the days of Mainz's two most distinguished citizens, Heinrich von Meissen, the poet, and Johann Gutenberg, the printer (see page 29).

Artistically speaking, von Meissen, popularly known as Frauenlob, was a descendant of the Minnesingers, just as these in turn were derived from the Provençal troubadours. Homage ballads of knights to fair ladies, expressions of the age of chivalry, were supplanted by ballads of the people when, in the 14th century, Frauenlob founded the first school of Meistersingers.

A century after Frauenlob came Gutenberg with his printing press.

Our professional guide led us to the Gutenberg statue in Gutenberg Platz, and, clearing his throat, began: "Mainz is justly proud of being the cradle of the typographical art, which"——

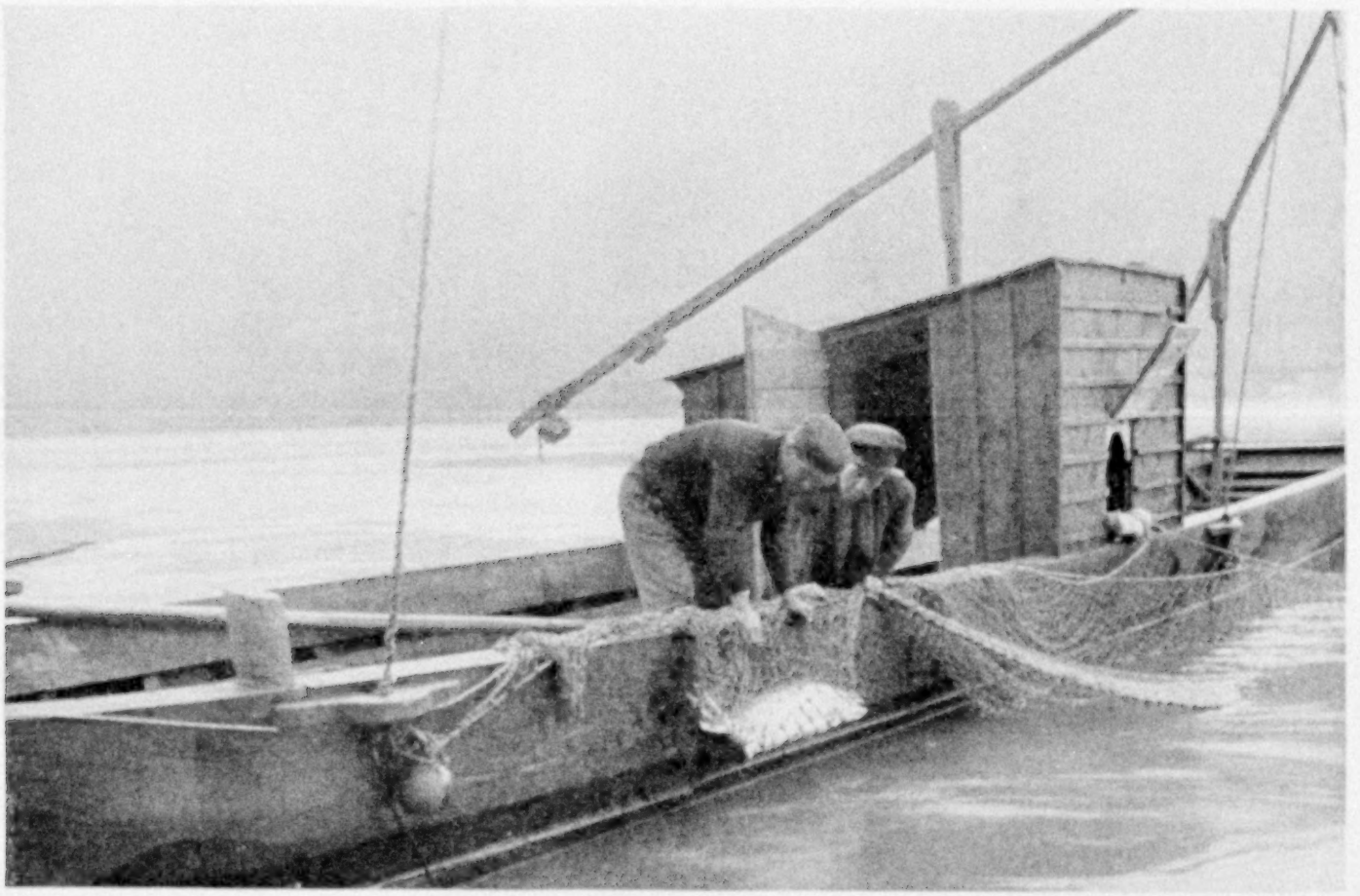
"But look here!" put in my friend. "I was under the impression that it was at Frankfort that Gutenberg"——

"Not at all. There's the statue, *nicht wahr?*" returned the guide with an air of finality. So that settled it.

We visited the neighborhood of Gutenberg's alleged first printing office and studied specimens of his early work. We rehearsed the old legend how Gutenberg, to amuse his children, once cut some letters out of tree bark, and how the moist letters left imprints on the paper in which they were wrapped, this leading to his conception of type.

We envisaged his struggles, for he twice mortgaged his tools for loans wherewith to develop his invention; and we imagined the storm his press must have occasioned in the manuscript-copying trade, and the discouraging comments of "ingenious, but not commercially practicable," that possibly were circulating about the year 1440.

It must have been timidly enough that in 1447 Gutenberg made the first printer-publisher's guess at "what the public wants" by issuing an astronomical calendar for that year. A few years later



Photograph by G. S. Urff

SALMON FISHING ON THE RHINE

A 30-pound catch is being hauled aboard. Its furious struggles avail not, for strong fists kill it with a few blows on the head.

came his first important work—a Bible. Then his coworker, Johann Fust, drew out and set up his own printing establishment, apparently convinced that, notwithstanding the high cost of paper, there was a future in the business.

THERE IS MORE LABOR THAN BEER IN A GERMAN LOGGER'S LIFE

Thanks to the *Rijn-Schelde's* cargo being in part for Frankfort, we had a day on the Main River, a day enlivened by the sight of huge, picturesque log rafts, each bearing a temporary shack, two raftsmen, and a keg of beer.

Floating downstream while trolling German ballads, with a pipe in one hand and a beer stein in the other, sounds more like a joy ride than an industry. As a matter of fact, logging bulks large among the enterprises of southwestern Germany, furnishing by far the greater part of seabound Rhine traffic; and there is more labor than beer in a logger's life.

In May-June and in October-November the lumberman is felling and barking trees among the Bavarian state forests in the Fichtel Gebirge range. The stripped logs are linked end to end in groups of a dozen. At freshet time these units float down the creeks to artificially created ponds, where they are reassembled in groups of 60. Upon gaining the Main's affluents they are reformed into small floats.

As the stream widens, these floats are attached to each other, until at Bamberg they have become rafts of 600 logs apiece. Four days later, at Würzburg, each raft is augmented to 1,000 logs. Still lower down, the rafts are carefully reconstructed for their long river journey, and at Frankfort they are put under steam tow for Rhine towns and the Netherlands.

The sales have already been effected by auctioning off the logs at the upstream camps. As for the raftsmen, their joy ride begins at Frankfort, where the employer sends aboard each raft stipulated rations of bread, meat, and beer.

At Frankfort we decided to have a vacation from smoked sausage and cool coffee, so we waved an *au revoir* to the skipper—who by now was fuming ter-

Photograph from Ernest Peterffy

OFF FOR A DAY'S WORK IN THE FIELDS

ribly over the housework, or barge work, whichever one may call it—and found a hotel on the Kaiserstrasse.

Frankfort is a striking instance of a fine, modern city containing a perfectly preserved medieval *stadt*, or town.

The city's commercial importance, dating from the times when it was a Roman trading post, is reflected to-day in its two fine harbors, which handle annually from 8,000 to 9,000 boats from the lower Rhine and 7,000,000 tons of freight for transshipment (see page 30).

THE BIRTHPLACE OF GOETHE AT FRANKFORT

Park concerts, opera, café life, boulevard strolling—these reinforced one's first impression of Frankfort as a center of gay modernity. Then, just off the beaten track, one discovers in Goethe's birthplace a quaint bit of the city's past.

A spacious and mightily dignified house it is, overlooking a staid rear garden and indicating that the poet sprang from a solid, well-to-do family.

Goethe Senior's room has a convenient corner window from which he could watch his son's comings and goings, while another room saw the budding author at work on his tale of lovesick Werther and "well-conducted" Charlotte, who simply "went on cutting bread and butter."

There, too, he launched early fragments of his "Faust."

If Frau Goethe ever had misgivings as

THE RHINE, THE MOUSE TOWER, AND THE RUINS OF EHRENFELS CASTLE, OPPOSITE BINGEN

Recent research has proved that there is little foundation for the familiar legend that the wicked Bishop Hatto, the grain profiteer of his day, was eaten by rats in the Mouse Tower (see text, page 17).

to her son's chosen profession, she needed only to take her husband into the adjoining room, where stands the poet's puppet theater, and exclaim, "There! I told you that thing would put nonsensical ideas in our boy's head!"

A 10-minute walk from his house to the Römerberg would have yielded the poet all the needed local color for the market scene in "Faust." To this perfect example of a medieval mart, where 16th-century emperors were crowned while its fountain ran with red and white wine, and where Frankfort's renowned fairs were held for 600 years, one would need to add only an orchestra and a peasant chorus in order to produce the kermis scene as it is played in Gounod's operatic version of Goethe's masterpiece.

The fountain running with wine is bettered in the poem by Mephistopheles' diabolical performance of making wine spring from auger-bored holes in a table.

Following the Faust trail from the Römerberg, one gains the near-by cathedral, recalling that Marguerite had just issued from confession when her future lover first accosted her.

Certainly it is difficult to stand within this 13th-century edifice, whose gemlike

Photograph by Wehrli A. G.

BINGEN, "A SMALLISH, HILL-SET TOWN, SIMPLE AND SWEET" (SEE TEXT, PAGE 19)

Caroline Norton's familiar poem is largely responsible for the fame of Bingen among English-speaking people. In the foreground is the seven-arched Drusus Bridge, across the Nahe, which flows into the Rhine at this point. It stands upon the foundations of a structure built by the Roman general, Nero Claudius Drusus (38-9 B. C.). On the skyline, across the Rhine, appears a national monument which commemorates the founding of the German Empire in 1870-71.

XUM

BINGEN, WITH THE TERRACED VINEYARDS CLOTHING THE SLOPES OF THE NIEDERWALD ACROSS THE RHINE

In the distance, at the left, is the Mouse Tower (see, also, illustration, page 23). The small stream flowing into the Rhine is the Nahe.

OVERLOOKING THE RHINE FROM THE MEDIEVAL CASTLE OF RHEINSTEIN

The origin of this stronghold, a few miles from Bingen, is lost in tradition, but it began to figure in the history of the river as early as 1279 and became the residence of the Archbishop of Trèves in 1348.

windows spectrally illumine the surroundings, without imagining Goethe's heroine at prayer before the altar, while her Evil Spirit accuses her from the surrounding shadows.

Our local guide piloted us to a monument representing Johann Gutenberg and his coworkers (see page 29). Clearing his throat, he began: "Frankfort is justly proud of being the cradle of the typographical art, which"——

"But Mainz!" we protested, aghast. "Surely it was there that"——

"Mainz! Pooh!" he returned. "Did those Mainzers really tell you that?" And he went on with his speech.

It was no easy matter for us mentally to transfer Gutenberg, his press, and his struggles, from Mainz to Frankfort; but we did it and thanked the guide for putting us right.

CONFUSING ASPECTS OF TRAVEL IN GERMANY

We decided to make several towns by rail and rejoin the *Rijn-Schelde* at Strasbourg. So we paid our hotel bill—and an unusual travel experience it was to find that our room rent had been reduced in accordance with the city's latest price-revision list—then got our tickets and jumped on the train.

But ticket-booking for Germany's occupied zone wasn't as simple as it sounds.

THE RUINED CASTLE OF EHRENFELS

Across the Rhine from Bingen rises this 13th-century relic, amid terraced vineyards. At this point the valley of the Rhine contracts suddenly, and there was once a series of rapids here which proved an insuperable barrier to navigation. Not until 1900 was the work of blasting completed and the channel cleared of the dangerous reef.

First, we bought tickets to the zone border; then hurried to the "zone ticket-window," only to learn that marks were not accepted there. Then we rushed to the money-exchanging window, fled back again, and finally dashed out of the innumerable passenger cues to chase after the just-departing train.

Getting into our proper carriage proved equally difficult. To the complication of four classes, smoking and nonsmoking compartments, and those reserved for ladies, this militarized train added carriages "for officers only," and others "for subofficers only." In fact, our quest for seats rather resembled the game of "Going to Jerusalem."

German railway stations commonly display large information signs, so large, in fact, as to be actually misleading if, like the two tourists who shared our carriage, one doesn't know the language. They were complaining bitterly of the German habit of naming different towns alike; they said they had certainly passed several way stations placarded with the same name, and that it was most confusing.

We did not understand this until we rediscovered them upon our arrival at Worms. They were standing inside the

Photograph by Emil P. Albrecht

THE OPEN-AIR MARKET OF MAINZ

Photograph by Melville Chater

ANOTHER VIEW OF THE MAINZ MARKET

The city is modern in aspect except for its cathedral and this market place. Its two most distinguished citizens were Heinrich von Meissen, the poet, and Johann Gutenberg, the printer (see, also, page 20).

station, under a big sign marked *"Ausgang,"* and were looking for the exit!

"We were told to get off here for Worms," one of them explained hotly to an official, "and here we are at Ausgang! Where's the exit? If you Ausgang people would only put up information signs in your station!"——

"Ausgang not! Vor-rms iss! Ausgang to outgo means!" responded the official with a self-control which was truly admirable.

THE STORY OF THE "NIBELUNGENLIED"

At Worms we had a bit of luck. We had visited the cathedral, whose site is associated with the "Nibelungenlied," and my friend was complaining of our romance-destroying century's disastrous effect upon such ancient cities. He said that he had come there to see the original headquarters of the Siegfried legend, and not business streets and wharfage, and that he thought he ought to get his money back.

THE GUTENBERG MONUMENT AT FRANKFORT-ON-THE-MAIN

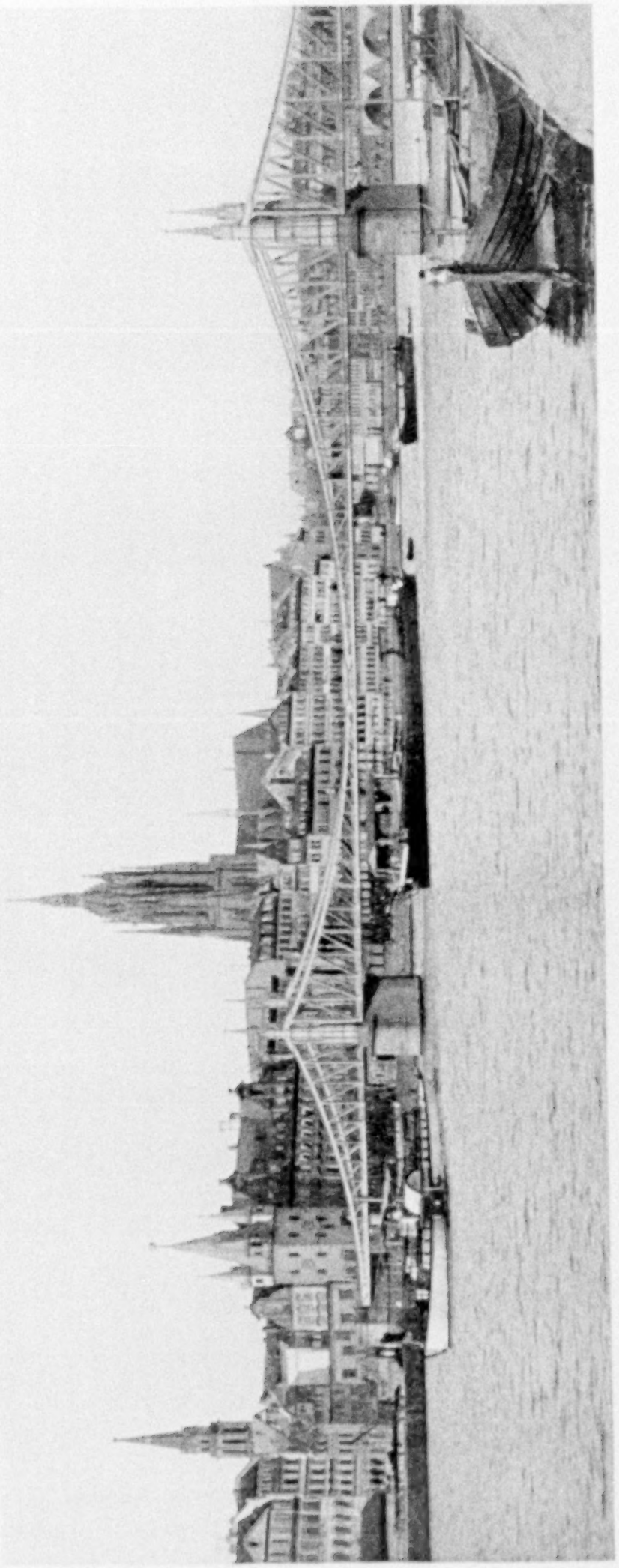
For centuries there has been a bitter rivalry among several German cities over their respective claims to Johann Gutenberg, reputed father of printing. The most dependable authorities agree that he was born in Mainz, but that Strasbourg, Frankfort, and Venice share with his birthplace the honor of first practicing the art (see text, page 35).

Just then the 20th century came to our rescue in the form of a cinema house. "Siegfried and the Nibelungen Treasure—Showing To-day!" ran the poster. Two hours of a highly picturesque film, reproducing for us the ancient Burgundian court at Worms, together with Siegfried's exploits, made us realize that our century isn't so romance-destructive after all.

Next day we dropped in and out of Heidelberg for a taste of that delightful hill-surrounded, Neckar-bordering town. Though during the World War its famous university almost closed its doors, the student body now surpasses pre-war figures, with 3,100 registrations. Heidelberg's democratic tradition still speaks in the fact that needy would-be students are, upon investigation, exempted from tuition payments and may subsist in the university's dining hall at 16 cents a day.

HEIDELBERG'S STUDENTS FIGHT EIGHT DUELS A WEEK

Its educational tradition speaks in the provision that each state-paid professor lectures for but six hours weekly, so that



THE RIVER MAIN AND THE CITY OF FRANKFORT AS SEEN FROM THE SUBURBS OF SACHSENHAUSEN

While Frankfort is a thriving modern commercial city, it has managed to preserve its medieval aspect in many quarters. Its history goes back to the days of Charlemagne.

he may still further himself and the university by special research work.

Its fighting legend still flourishes in a minimum of eight duels a week, when padded and goggled fencers cross rapiers for the honor of their respective German states, and for the personal honor of receiving the coveted steel slash across their unprotected cheeks.

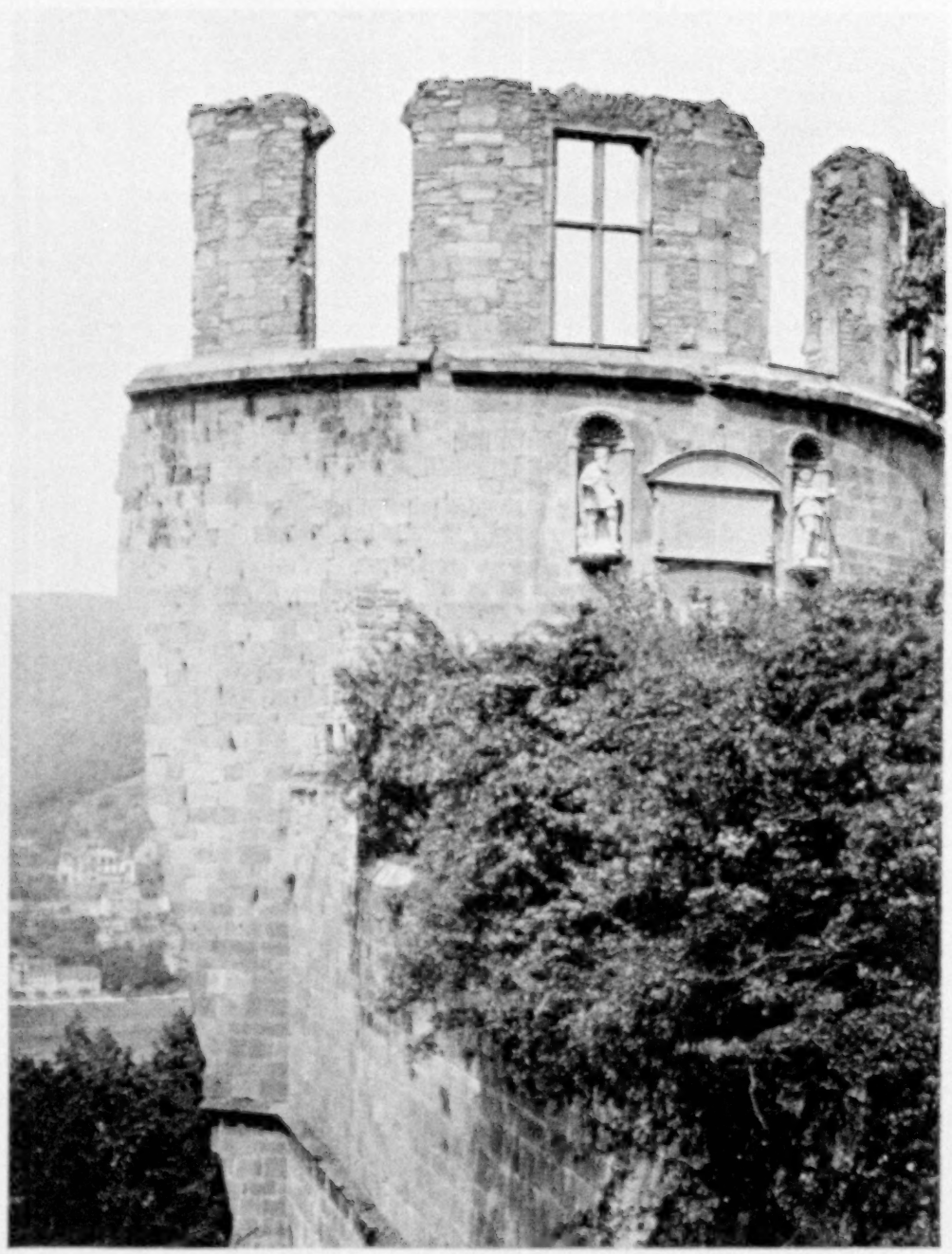
And, most picturesque survival of all, its tradition for escapades still lives in the university prison, where the incarcerated students, some of them subsequently generals in the World War, covered ceilings, walls, and windows with self-painted portraits, doggerel rhymes, and memorials of their scrapes.

"We had been hitting it up pretty hard on beer," confesses one of these memorials which we translated into colloquial language. "We swiped a vegetable cart and drove down High Street, soaking everyone with carrots and tomatoes. And now this dingy hole, with bread and water, is our reward for trying to put pep into Heidelberg!"

The original prison dates back to the 14th century. That university prison life is not what it used to be seems indicated in the local story of how the

STATUE OF PERKEO, A COURT JESTER OF THE 18TH CENTURY

This grotesque wooden figure stands in the cellar of the Heidelberg Castle, near the famous Heidelberg tun, a monster cask having a capacity of 49,000 gallons.



ONE OF THE RUINED TOWERS OF THE HEIDELBERG CASTLE

The remains of this majestic structure stand on the site of a castle erected at the beginning of the 13th century. Reduction to its present ruinous condition was due not to armies, but to a bolt of lightning in 1764.

Photograph by H. Parobin

THE OLD FRENCH QUARTER OF STRASBOURG

"Strasbourg is a plexus of waterways. The rivers Rhine, Meuse, Marne, Seine, and Rhône all contribute segments to a great circle of canals which has this city on its eastern circumference" (see text, page 34). In the distance, at the left, may be seen the spire of the cathedral rising to a height of 465 feet, which, with the single exception of the tower of the Rouen Cathedral, is the tallest in France.

XUM

Photograph from Melville Chater

A SHIPBUILDING YARD AT STRASBOURG, FRANCE

Strasbourg was a French city for more than two centuries, from 1648 to 1870, when it capitulated to the Germans after a siege of seven weeks. It was reoccupied by French troops in November, 1918, and was restored to the French people by the Treaty of Versailles (see text, page 34). Because of swift currents and the variation in the water levels beyond, this city is at the head of main navigation of the Rhine.

"ANYTHING FOR ME?"

A letter carrier of the Wolfach Valley, Black Forest region, and a peasant woman in her Sunday best. These costumes are worn only on Sundays, wedding days, and at funerals.

jailer was unable on one occasion to show some visitors through the cells "because," he explained, "the prisoners have gone off on a walking trip and have taken the keys with them."

FIVE GREAT RIVERS PAY TRIBUTE TO STRASBOURG

From Heidelberg we proceeded to Kehl, where we passed through the French customs, then crossed the Rhine, out of Germany and into Alsace-Lorraine.

Our stroll around Strasbourg revealed, in a kind of lagoon where three canals met, barges moving to and from such widespread points as Marseille, Paris, and Amsterdam. In fact, Strasbourg is a plexus of waterways. The rivers Rhine, Meuse, Marne, Seine, and Rhône all contribute segments to a great circle of canals which has Strasbourg on its eastern circumference.

This ancient Celtic town still justifies, therefore, its historic name of Stratisburgum, or Town-on-the-Routes.

We arrived at the cathedral in time to see the noonday functioning of its curious astronomical clock, with its parading effigies of the Apostles, its crowing cock, its skeleton striker of the hours, its seven pagan deities symbolizing the days of the week—the whole suggesting the quaint conceits of German toymakers.

Rising like some ancient landmark between France and Germany, Strasbourg cathedral reveals, quite naturally, art influences of both countries. Its rich beauty was evolved throughout some 250 years by master architects from several countries; and its abutting tower displays at a dizzy height the scratched names of many distinguished pilgrims, including Voltaire and Goethe, from both sides of the Rhine. In these several senses it might be called an international cathedral.

Strasbourg came into French hands for two centuries when, in 1648, Alsace was ceded to France in recompense for protection extended to the German Protestant princes. In 1870 the city capitulated to Germany after a seven weeks' siege. In November, 1918, it was reoccupied by French troops.

BOYS OF HASLACH, IN THE BLACK FOREST DISTRICT

In the remote valleys of the forest, especially in the southern section, the peasants still wear their national costumes on Sundays.

In reintegrating Alsace-Lorraine's 5,605 square miles and 2,000,000 people as the Departments of Moselle, Haut-Rhin, and Bas-Rhin, France's problem is to adapt the peculiar local and German laws to her own national code.

"BABYTOWN-ON-THE-RHINE"

Post-war Strasbourg contains an interesting experiment in the way of encouraging family life. Four-room bungalows, erected in a charming suburb, are rented to young couples at about 60 per cent less than the normal rate, the layout of houses and playgrounds being specially adapted for the upbringing of children. Indeed, the sole stipulation and social purpose are that the renting couples must be the parents of young children.

Possibly France, with her low birth-rate, casts an interested eye upon this experiment. And where more appropriately than at Strasbourg, the city of storks, could have been inaugurated this little Babytown-on-the-Rhine?

The last thing our local guide showed us was a square in which rose a statue of our old friend, Johann Gutenberg (see text, pages 20 and 26).

"Strasbourg," he began, "is justly proud of being the cradle"——

But we interrupted him sternly. We told him about Mainz and Frankfort; we said that, as tradition-respecting Americans, we objected to having Gutenberg's cradle dragged about so promiscuously; and we commanded him to lead us to the nearest authority on the subject, which he did.

Our inquiry revealed that in past centuries there had been a terrific squabble among rival German towns over the possession of the Gutenberg tradition, a squabble entailing the forging of documents and the "discovery" of a bit of his original press four centuries after his

Photograph by Melville Chater

THE FERRY AT BASEL

The power employed in sending this little craft across the river is the current of the Rhine itself (see text, page 37).

death. It is certain that he was born at Mainz and there developed his invention, and that Strasbourg and Frankfort shared with that town and Venice the honor of first practicing the art.

Beyond this, the Gutenberg tradition is best likened to the mix-up of type known among printers as "pi."

FAMILY LIFE RESTORED ON THE BARGE

Learning that the *Rijn-Schelde* was due, we went down to the docks, arriving just in time to see a touching reunion.

On the quay stood the skipper's wife. She was excitedly waving her umbrella at the approaching barge, aboard which stood the skipper, who was as excitedly waving a frying pan at her. Their ensuing reunion on the dock appeared to be highly satisfactory to both.

It appeared that after a fortnight at Antwerp she had grown restless and had come on by rail to await the *Rijn-Schelde's* arrival. She said that 12 years of barging had ruined her for life ashore, and that she supposed she might just as well put up with the Rhine and its scenery, after all.

Then she fell to and cooked us a splendid dinner, thereby causing her delighted husband to announce that a womanless barge was almost as bad as engine trouble.

A few days later we waved them farewell, as the *Rijn-Schelde* headed downstream. Owing to low water, the skipper had transferred the balance of his cargo to a light-draft barge which, incidentally, would carry us two as far as Basel.

THE RHINE IS A TRICKY STREAM

Strasbourg, because of swift currents and the variance of water levels beyond that city, really constitutes the head of Rhine navigation. And the Rhine, as our skipper had never wearied of saying, is the trickiest stream that ever ruined a barge owner in a single season.

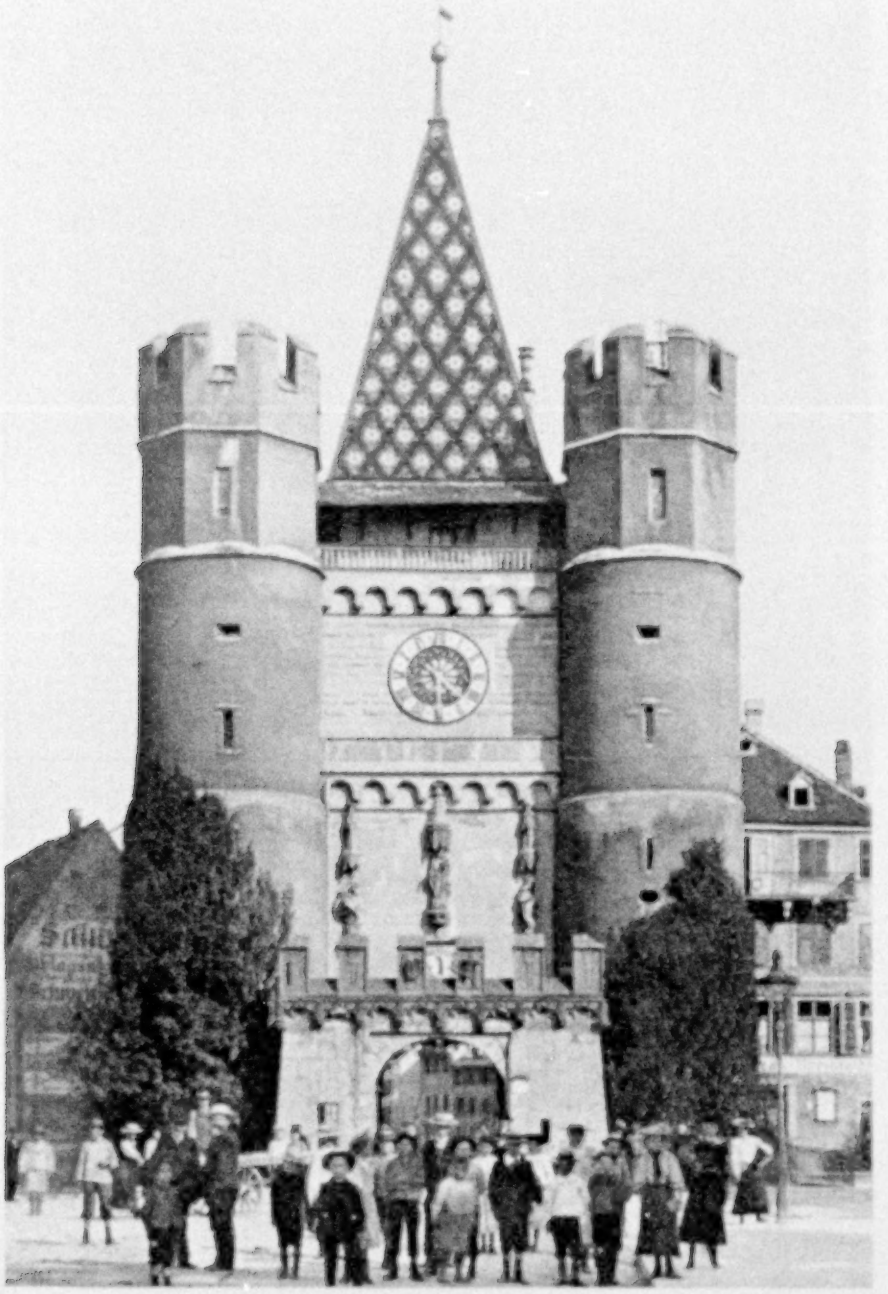
While normally it is 9 feet deep up to Mülheim, 6 feet at Bingen, and 4 feet near Strasbourg, the waters often drop or rise as much as 3 feet, and this in an incredibly short space of time, due to drought or to the melting of Alpine snows.

Such conditions, or perhaps floods on the upper stretches, may force a skipper

to transship cargo or discharge it prematurely; hence a Rhine bill of lading contains special protective clauses, such as "low-water supplements."

With the outskirts of the Black Forest on our left, our small group of steam-towed barges moved slowly upstream between the dikes, or walls, which here and there spoke of protection against the possibility of floods descending from the river's Alpine reaches.

Would it be advantageous to construct a 127-kilometer canal, paralleling the Rhine, between Strasbourg and Basel? The French think so, and the projected plans indicate a 60 per cent cut in transportation costs between the two cities. Swiss opinion prefers "the free Rhine" and its regularization by the creation of channels in the river bed.



Photograph from Melville Chater

THE SPALENTHOR, BUILT IN 1400, FINEST OF THE OLD GATES OF BASEL

A FERRYBOAT WITH A UNIQUE POWER DEVICE

The Strasbourg-to-Basel section of the Rhine is open for about 200 days a year. The hard upstream pull is in part recompensed by the rapidity of the return trip, a fast-freight steam barge making Strasbourg in five hours, and reaching Rotterdam within three days.

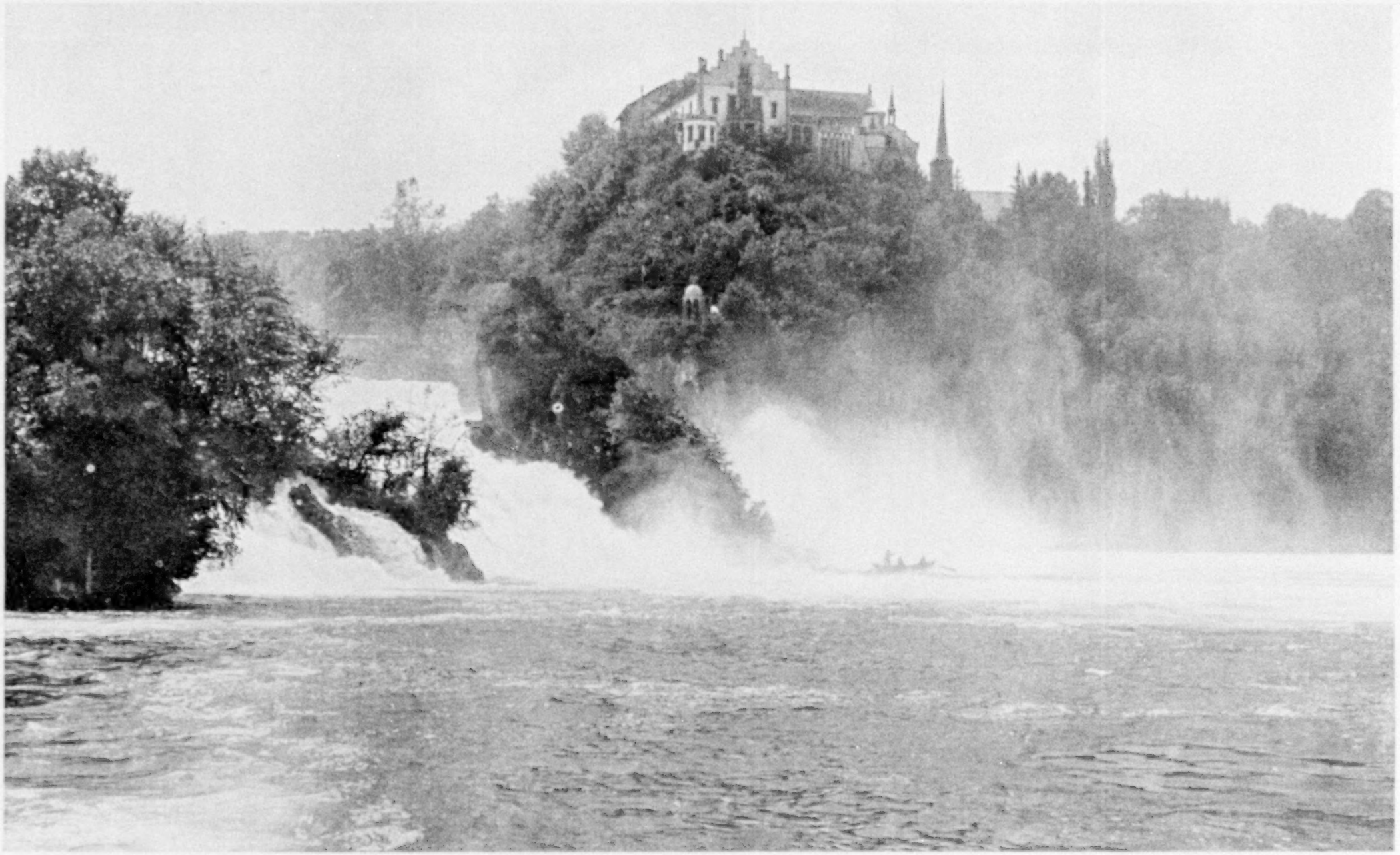
The genius which turns obstacles into assets was certainly evident in the bank-to-bank ferryboat which we sighted on pulling into Basel. It functioned by transforming the swift current of 5 to 9 feet per second into a force which yielded the craft a lateral direction.

The outfit was simplicity itself: a telegraph wire, strung overhead from bank to bank, and a smallish boat pointed upstream, its bow connected by a line to two traveling wheels which ran along the wire (see page 36).

The steersman merely jammed his powerful rudder, so as to deflect the boat to a position slightly lateral to the head-on current. Immediately the side swipe of waters put it in motion, causing a drag on the telegraph wire; the traveling wheels began to move, and—hey, presto!—the launch sped across the Rhine to the opposite landing stage.

The return trip was effected by the steersman jamming his rudder in the reverse direction, thereby pointing his prow slightly toward the opposite bank.

The device, which was adopted 60 years ago from similar boats seen on the Moselle River, is in use at four of Basel's ferries. The spectacle of Father Rhine supplying mechanical force for crossing



Photograph by Wehrli A. G.

LAUFEN CASTLE, OVERLOOKING THE FALLS OF THE RHINE

This is one of the finest cataracts in Europe. The water descends in three leaps over a ledge of unequal height. Including the rapids, the fall is nearly 100 feet high. The falls are at their best in June and July, when the river is swollen by melting snow.

XUM

his own waters is typical of Switzerland, where man's resourcefulness has so splendidly conquered many of Nature's obstructions.

BASEL IS THE GATEWAY OF THE UPPER RHINE

A stroll along Basel's tree-shaded river embankments shows three countries at a glance: Switzerland at one's feet, Germany's Black Forest across the Rhine, and France's outposts in the low Alsatian hills.

Basel is the gateway of the upper Rhine. Not water traffic, but Switzerland's "white coal," is mainly what lies between that gateway and Lake Constance, in the shape of four great hydro-electric stations. Compared with the economic value of what they draw from the river in the way of 180,000 horsepower, with twice that amount still awaiting development, the Nibelungs' fabled under-Rhine treasure pales into insignificance.

Railway power and factory power, cheap city lighting, and cheap propulsion of Basel's ribbon machines are among Father Rhine's local benefactions. Quite commonly in Swiss towns the house meter is obviated, and one burns light *ad libitum* on a flat annual rate of so much per bulb.

The ribbon machine is largely a home institution at Basel, where centers an industry producing annually from $10,000,000 to $15,000,000 worth of ribbons for export.

What with this, together with silk spinning and the production of coal-tar dyes, Basel has the enviable reputation of being one of the wealthiest cities of its size in Europe.

With the upper Rhine's stretch of more than 160 miles still before us, and early mists already giving their seasonal warning, we went on by train to Neuhausen, where, despite an impenetrable fog, my friend insisted on getting off to visit the Falls of the Rhine. I said that I had seen plenty of fogs, and that I would go on to Stein. He retorted that I was going to miss a magnificent spectacle, and I bet him 20 francs that he wouldn't be able to see anything of the falls (see page 38).

From Schaffhausen, that afternoon, the little steamer chugged its way up a narrow and sinuous Rhine, here and there wildly wooded, with occasionally a brief stop at some sylvan townlet beside an old, covered bridge, with a glimpse of riverside laundrywomen, a snatch of passing gossip, and so on again.

And meanwhile, as it was obvious that the now-vanished fog must have ruined my friend's morning at the falls, I grew quite sympathetic over his having missed this intimate stretch of the Rhine and, incidentally, a matter of 20 francs.

THE FAIRY-TALE TOWN OF STEIN

Toward sunset there loomed up a castle-topped crag. At its foot was a river-fringing village with flower boxes begaying the windows, a gabled inn's waterside terrace, and a hop-skip-and-jump length of red, wooden bridge across the slender Rhine, which lost itself in distances where a gray church spire or two rose rapier-like against the sky.

Was I still in the 20th century, I wondered, or was I dreaming over some medieval romance? As I wandered through Stein's half-dozen unnamed streets, with their overhanging balconies and their house fronts painted with medieval tableaux, I felt that I should be bestriding a charger and accompanied by a largess-scattering squire (see page 41).

The house-front picture gallery included in its subjects a cardinal's reception, ladies being burned at the stake, Androcles and the lion, boar-hunting scenes, and—this was on a tavern—a representation of the pelican, with her brood sucking blood from her breast, the Gothic-letter caption reading: "Here you will be refreshed as generously as the pelican refreshes her young."

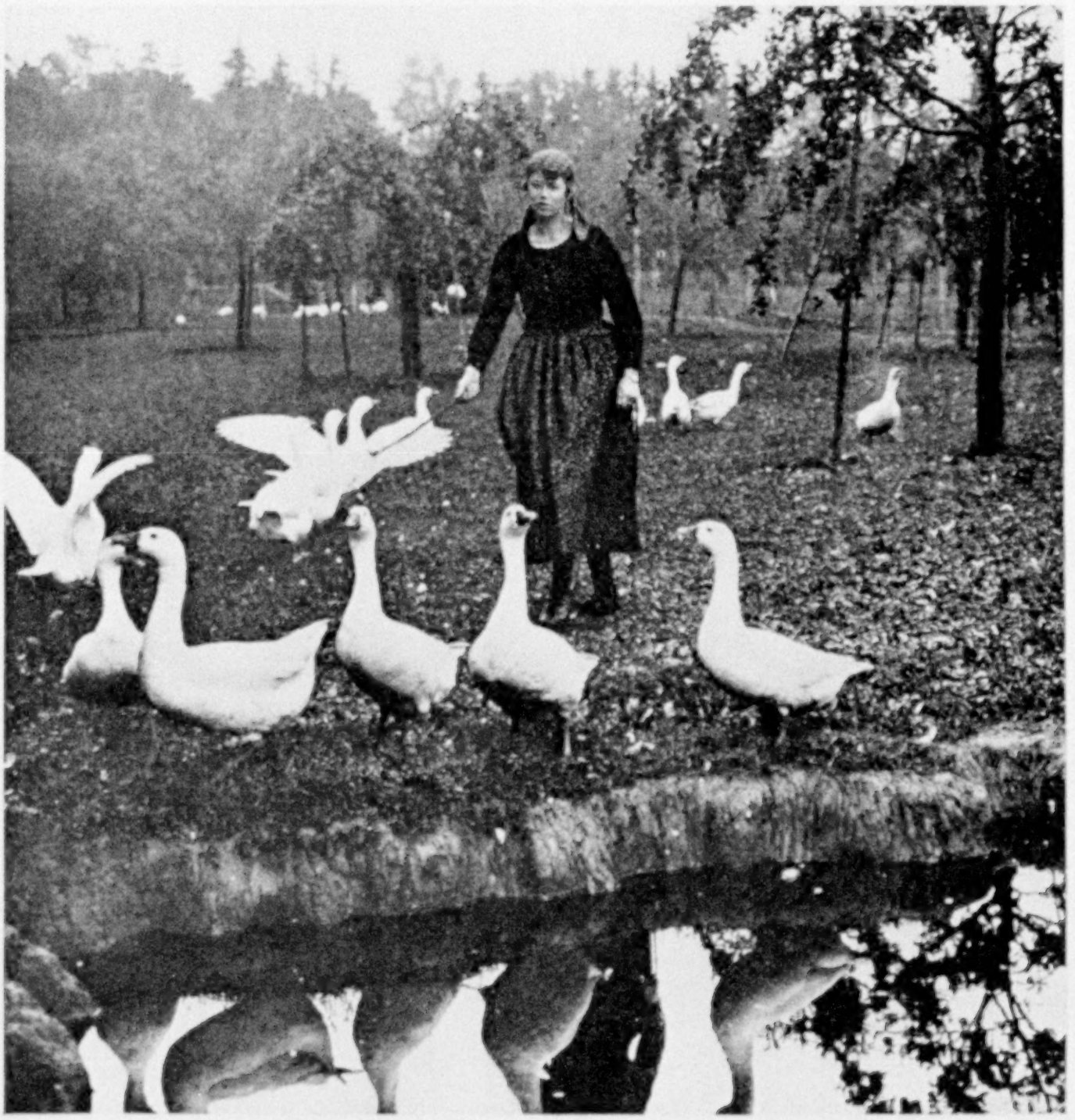
That night, having been candle-lit to bed, I pondered over Stein, the fairy-tale town, and its simple folk, so close to cities yet so unspoiled, until the Rhine under my window sang me to sleep.

Next day my friend turned up. He launched into eulogies upon the Falls of the Rhine, and annoyed me by being so sympathetic over my having missed them.

"Could you see anything of them at all?" I inquired suspiciously.

"See them?" he snorted. "Of course, I saw them, and you owe me 20 francs."

That afternoon a tourist whom he had picked up en route stopped me in the



Photograph from Ernest Peterffy

A GOOSEGIRL OF THE RHINE VALLEY

street. He said: "Some dare-devil, that friend of yours! Yesterday, at the Falls of the Rhine—it was so foggy you couldn't see your hand before your face—he got a rope and made the guide lower him over the bank and through the fog to the water's edge. He said that he wanted to be able to say that he'd *seen* the Falls of the Rhine."

Next day, while skirting Lake Constance on the way to Rorschach, through a world once more fog-muffled, my friend said, "We wouldn't be able to see anything of the lake on such a day as this. Let's go straight on by rail to Chur."

"Just the same," I replied, "I'll bet you 20 francs that I'll be able to see Lake Constance." He gave me a suspicious glance.

"Oh, I suppose there'd be some low trick about it," he answered with a virtuous air.

THE TOY PRINCIPALITY OF LIECHTENSTEIN VISIBLE FROM THE RHINE

Two hours beyond the head of the lake the fog's blinding gray suddenly melted, revealing in vivid greens a crystal-clear mountainland. The relief was so welcome, the sun-smitten air so tonic, that at

Sevelen we jumped off the train and started to walk. We reached the farther end of a wooden bridge which straddled a very shallow and pebbly stream, hardly recognizable as the Rhine.

Ahead rose a magnificent pine-clad mountain, castle-topped, its flanks clothed with the sleepiest of old-world villages, through whose sole street great hay wains jogged and goosegirls drove their flocks.

"This is Vaduz, the capital of Liechtenstein," a passer-by informed us. "Yes, our prince allows travelers to visit the castle."

"Our prince," goosegirls, a village capital, and the principality's entire extent along the Rhine practically visible from where we stood! Small wonder that we felt like characters moving in one of the novelists' "toy-kingdom" romances.

To our undying regret the train schedule would not admit of our encompassing little Liechtenstein, with its 65 square miles and 10,000 inhabitants, or of visiting the château of Prince Johann II. And though we were really keen, for the first and only time in our lives, to go through the customs examination, we were robbed of even this experience by the fact that Liechtenstein's customs, postal, and telegraph services are arranged through the Swiss Government.

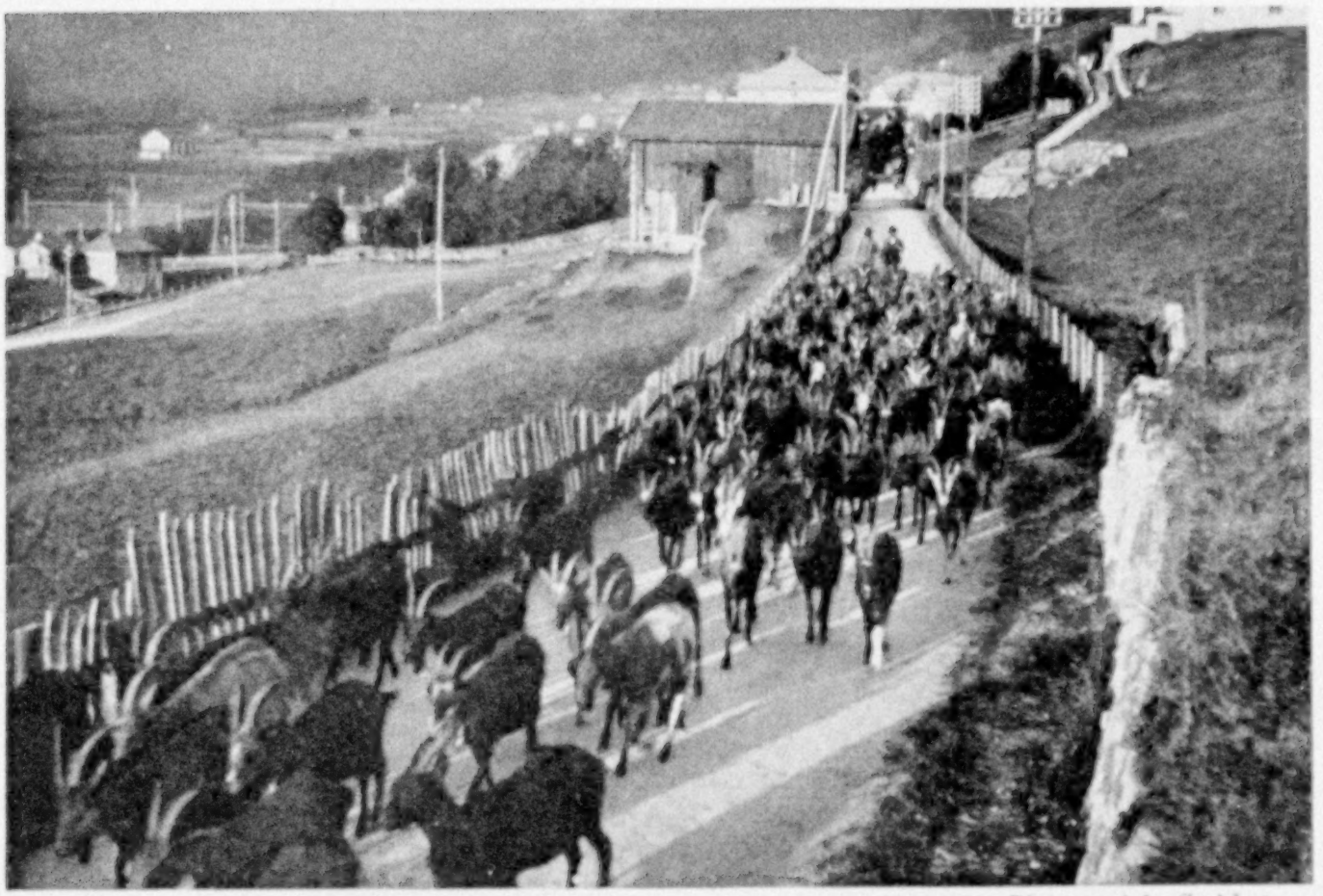
An hour later the railway brought us to Chur. Thence, by an electrified, narrow-gauge line, we climbed onward toward Disentis, rising 16 feet a minute along the rim of a twisting gorge, at whose bottom the slim, swift Vorder Rhine, fresh from its source among Alpine snows, ran gray green over a semi-arid bed.

Still the green, scarlet-flecked mountains lifted, lifted, lifted, with shrill rivulets rushing down them to add their little to the slow making of a great river. And at last came the snow, blindingly white, on sheer rock profiles that cut with razor-like sharpness the upper sky. And, though the peasants were already carting their winter forage and stacking their winter logs, a hot sunshine deluged the river's wooded ravine, from which rose to us earthy breaths as of spring.

Photograph from Melville Chater

STEIN-AM-RHEIN, SWITZERLAND

"As I wandered through Stein's half-dozen unnamed streets, with their overhanging balconies and their house fronts painted with mediæval tableaux, I felt that I should be bestriding a charger and accompanied by a largess-scattering squire" (see text, page 39).



Photograph by Carl Lutz

A HERD OF GOATS: DISENTIS (SEE TEXT BELOW)

At twilight the distant snow peaks went rosy in the wake of a sunken sun. Sleepy bell-tinklings came from homeward-driven flocks, as we left the train at Disentis, a hill-slanting village brooded over by a white, sky-shouldering alp.

"You'll make Andermatt to-morrow," the host at our humble inn informed us. "That is, unless we're snowed in overnight. The postal wagons quit weeks ago, and any morning we may wake up to find all local communications closed till next spring. You're about a month out of season."

It wasn't encouraging. We went to bed feeling like the last rose of summer faced by a blizzard forecast.

THE SNOW CRADLE OF THE INFANT RHINE

Sheer apprehension woke us at sunrise. Luck had played on our side. By 8 o'clock we were afoot on the still snowless road to Andermatt, intermittently shivering or thawing out as the mountainous route rose into sunny heights or dropped into valleys still dark in early dawn.

At last the sun cleared the highest of the surrounding Alps and we beheld, crowning a world that might be snow-bound to-morrow, the outstretched brilliance as of a perfect summer's day.

Our 15-mile hike edged upon a dizzy gorge where, between the pines' spearlike ranks, rushed the turbulent Vorder Rhine, now laving some farm-dotted valley, and at last pointing us straight at an enormous alp, rising miles away like some impassable snow wall across the world.

Everywhere sounds of running water haunted us, coming from countless rills on their headlong way down into the gorge, and once, when we crossed a green meadow, it proved morasslike with its hidden springs. The whole region was contributing its moisture to the beginnings of the Rhine.

Trite but true is the simile that likens man's life to the course of a river. Both have their cradle, their season of boisterous play, their gradual broadening and sobering for the ends of commerce and service. For six weeks we had followed Father Rhine's more than 600 miles of varied life, until now he was a mere infant of the Alps, fed on melted snows.

Photograph by Ad Astra-Aero

AN AIRPLANE VIEW OF ANDERMATT

The white ribbon which meanders up the mountain slope is the road leading to the Oberalp Pass, 2,000 feet above the Swiss town.

Under the sky's burning blue, with butterflies hovering over daisies along a roadside a-shimmer with warmth, we toiled upward by zigzag ways along the base of that great snow mountain, the Badus, to where, at 6,720 feet, we gained the summit of the Oberalp Pass.

A few miles beyond and 2,000 feet below the pass lay a great green valley, the Urseren Thal, centered by what resembled at our altitude a cluster of bird houses. It was the town of Andermatt (see above). And at the Urseren Thal's opposite end rose another great snow mountain, facing the Badus at our end of the valley.

Surely we felt that we were standing on the top of Europe; for we knew that from the mountain beyond the Urseren Thal the beginnings of the Rhône were descending, to swell southward to the Mediterranean; and, rising out of a little green lake on the farther shoulder of the Badus, was the glistening thread that we now beheld dropping into the Vorder Rhine's chasm, on its long journey to the North Sea.

"Listen!"

Through the intense stillness there came to us the faint, shrill sound of rushing water. It was singing to itself in its snow cradle—the infant Rhine!

PAGES FROM THE FLORAL LIFE OF AMERICA

THE 24 color plates, representing 55 flower paintings, appearing in this number of the NATIONAL GEOGRAPHIC MAGAZINE, are from the brush of Miss Mary E. Eaton, whose work has brought so much pleasure to members of the National Geographic Society during the past decade. They are reproduced from The Society's "The Book of Wild Flowers," * recently published, and are printed in the MAGAZINE in order that those who have saved their back numbers may have a complete collection of Miss Eaton's published paintings.

The flowers represented in this number belong to 49 different families and, together with those previously published, make a representative cross-section of the floral life of America. (For more detailed biographies, see "The Book of Wild Flowers.")

HAIRY RUELLIA

Ruellia ciliosa Pursh Acanthus Family [Plate I, left]

The hairy ruellia flourishes in dry soils from New Jersey to Nebraska and southward to the Gulf of Mexico. It is a hardy perennial, blossoming from June to September. In addition to its fine, showy flowers, it has small cleistogamous ones that look like unopened buds. Some of the carpenter-bees have been seen biting circular pieces out of the corolla and carrying them away to plug up cells in the tunnels they excavate in soft wood as nesting galleries.

WESTERN SPIDERLILY

Hymenocallis occidentalis (Le Conte) Kunth Amaryllis Family [Plate I, middle]

The spiderlily, with its long stamens and its peculiarly placed anthers, looks like the daddy longlegs of the flower world. The species that come into our territory are few. They are mostly tall, bulbous herbs, and, like their tropical cousins, are exclusively American. They get their genus name from the Greek, the term signifying "beautiful membrane" and referring to their strikingly handsome crowns. The spiderlilies flower in late summer.

GOLDENCLUB

Orontium aquaticum L. Arum Family [Plate I, right]

The goldenclub has a range that reaches from New England to the Gulf of Mexico, and is usually found in shallow ponds, standing water, and swamps. The sight of a large mass of these flowers is one not soon to be forgotten. The species lacks the spathe characteristic of the beautiful white robe of the calla lily, or the bright green of the "pulpit" of its other cousin, Jack-in-the-pulpit; but this is because it has cast off its formal clothes and appears only in its bathing suit when it commands our attention. Like the sweetflag, the goldenclub, inhabiting watery ground, has to rely mainly on gnats and other minute insects as its intermediaries in the process of fertilization, and has, therefore, arranged its flowers in large masses of very small individuals, which are readily fertilized by these insects walking about over them.

COMMON AMARANTH

Amaranthus hybridus L. Amaranth Family [Plate II, left]

The common amaranth, like the black-eyed-susan, seems to offer a reversal of the usual course of weeds, for it appears to have come eastward instead of going westward. It gets its name from a Greek term meaning "unfading," in recognition of the fact that its flowers retain their color when dry. It blossoms from July to October, and is abundant in both cultivated and abandoned ground. A native of the Southwest, it not only has pushed its way eastward, but has also spread northward and has become a widely dispersed weed, with a vast territory under colonization. Its most familiar name to laymen is probably pigweed. One variety of this species is cultivated as a flower in many gardens.

PEARL EVERLASTING

Anaphalis margaritacea (L.) Benth. & Hook. Aster Family [Plate II, right]

With a range that reaches from the Atlantic to the Pacific and far into Canada, the pearl everlasting possesses many local aliases, such as silver-leaf, moonshine, none-so-pretty, lady-never-fade, ladies'-tobacco, and silver-button. An adventive from Europe, it has spread until it has added even Alaska to its empire. Furthermore, it has ventured as far south as North Carolina. Dry fields and open woods constitute the environment in which the pearl everlasting thrives best, and July to September, the season in which it puts forth its flowers.

For fertilization it is entirely dependent on its insect guests. It bears male and female florets on separate heads, although on the same plant, so that it must cater to its patrons. The female florets have tubular, five-cleft corollas, two-cleft styles, and a large number of hairy

* THE BOOK OF WILD FLOWERS, describing 250 species of wild flowers and familiar grasses, representing 114 families, with 128 pages in full color. Art binding in brown, bronze, and gold, $4, postpaid. Obtainable only from National Geographic Society, Washington, D. C.

bristles. The male florets are more slender. The nectar of the pearl everlasting is protected from pilfering ants by a cottony substance on the wiry stem of the plant. It is next to impossible for the ants to travel through this fluffy defense.

DOWNY HAWTHORN

Crataegus mollis (T. & G.) Scheele Apple Family [Plate III, left]

When Missouri came to adopt a State flower the legislature was guided by the recommendations of the Daughters of the American Revolution of that State. The agitation of the subject began following the publication of the article on State Flowers in the NATIONAL GEOGRAPHIC MAGAZINE in 1917. The daisy was at first recommended by a vote of the conference of the Daughters in 1919, but the following day a motion to rescind that action, because the daisy was not a native and was the emblem of other States, was passed. A glowing tribute to the red haw as a native flower whose berries were prized by the pioneers for making jellies and whose wood served them as material for shuttles used in weaving homespun resulted in the adoption of that flower and a recommendation that the legislature accept it.

This was done in 1923, and the act specifies *Crataegus* as the genus. This group contains perhaps a score or more of species indigenous to Missouri, but the Daughters of the American Revolution generally favor *C. mollis* or *C. crus-galli*—respectively the downy hawthorn and the cockspur thorn in poplar nomenclature, both being included in the term "red haw" as used by laymen.

It is said that more birds nest in the dense foliage of the Missouri hawthorns than in all other native trees, and that the red cardinal and the brown thrasher particularly prefer it. The school children use the hawthorn blossoms to decorate their school rooms in the spring and the berries in the fall.

BEGGAR-TICKS

Bidens frondosa L. Aster Family [Plate III, right]

This beggar-ticks is one of a group of about 75 species of wide distribution whose seeds have hooked teeth for stealing transportation from passing creatures. The genus includes the bur-marigolds and the tickseed-sunflowers.

Bidens frondosa is found in moist soils from Nova Scotia to Florida and from British Columbia to California and Texas. It has also gone across the seas to repay Europe in part in her own coin for weeds sent to America.

This species of beggar-ticks is variously known as the rayless marigold, cuckles, old-ladies clothes-pins, beggar-lice, etc. Its blossoming time is from July to October.

SKUNKCABBAGE

Spathyema foetida (L.) Raf. Arum Family [Plate IV]

This evil-smelling, insect-baiting relative of the proud calla lily and the savory sweetflag lives in swamps and wet ground over a territory that reaches from the Atlantic seaboard to and beyond the Mississippi River and from Nova Scotia to the Gulf of Mexico. Its flowering season is from February to April, and whoever invades its precincts about that time is likely to debate with himself whether it is the odor of putrid meats, cooking garlic, or aroused skunk that assails his nostrils.

The skunkcabbage has a habit of appearing too early in the season to be served by the bees and butterflies. Only the flesh flies are then on the wing. And so the unsavory odor that disgusts us and delights them is prepared and set out in vegetable tissue that has the guise as well as the odor of decaying meat.

The spiders have learned that the flesh flies congregate in the skunkcabbage's pantry, and they build webs galore over the entrances to the spathes, so as to trap them the more readily.

So, also, some Nature fairy whispered into the ear of some of the swamp-dwelling birds that their nests would be safe in the hollow of the skunkcabbages, and the lizards got word by grapevine telegraph that their enemies would stay away if they dwelt beneath the skunkcabbage. Cattle and sheep have been taught alike by its bad odor and its acrid juices to give the foetid plant a wide berth.

BEECHDROPS

Leptamnium virginianum (L.) Raf. Broom-rape Family [Plate V, left]

Beechdrops grow from six inches to two feet high and are found in beech woods from Nova Scotia to Florida and from Ontario to Louisiana. They are sometimes called cancer-root, cancer-drops or Virginia brown-rape. They are parasitic plants with the common characteristics of the broom-rape family. The plant preys mainly on the roots of the beeches, another instance of striking specialization. It flowers from August to October.

VIPERS-BUGLOSS

Echium vulgare L. Borage Family [Plate V, right]

This species is a large biennial, native of Europe, growing in dry places, particularly in cornfields, where it often becomes a troublesome weed. Its range is from Nova Scotia to Ontario, and southward to North Carolina and Nebraska, where its flowering season runs through June and July. The flowers are at first pink or reddish, later changing to blue. The spots on the stems resemble somewhat those on the viper, and our forefathers concluded therefrom that it had the property of healing vipers' bites. Hence its name.

GLOSSY BUCKTHORN

Rhamnus frangula L. Buckthorn Family [Plate VI, left]

The glossy buckthorn, found in bogs in sections of the North Atlantic Coast States, and sometimes known as the black dogwood, has

been naturalized from Europe. It is also known in some localities as berry-alder and Persian-berry. The shrub bears its flowers in May and June and its fruit ahead of the frost.

DEVILSBIT

Chamaelirium obovale Small. Bunchflower Family [Plate VI, right]

This flower is found in moist meadows from southern Canada to Florida and Arkansas, and sometimes travels under such names as blazing-star, unicorn-root, unicorn-horn, drooping star-wort, and false unicorn-plant. It flowers in May, June, and July.

ARROWLEAF TEAR-THUMB

Tracaulon sagittatum (L.) Small. Buckwheat Family [Plate VII, left]

This species lives in wet soil from Newfoundland to Florida and westward to British Columbia and Kansas. Its flowering season is from July to September. It is a climber, sprawling over other plants to find its place in the sun. Its prickles are rather more savage than those of halberdleaf tear-thumb, of the same range. One who has had experience with these prickles feels that there was more truth than poetry in the mind of the man who gave it the English name it bears.

SPIDERFLOWER

Cleome spinosa L. Caper Family [Plate VII, right]

The spiderflower, sometimes passing under the name of prickly cleome, is a native of the Tropics, brought here to grace our gardens. After escaping from human pampering to the open spaces, it established an independent existence. It has been able to brave the frosts as far north as southern New York and Illinois, and prefers waste places for its habitat.

RATTLESNAKE-ROOT

Prenanthes alba L. Chicory Family [Plate VIII, left]

This species occurs in Canada and the northern part of the United States as far west as the Rocky Mountains. Joy-leaf, cancer-weed, lion's-foot, and wild lettuce are some of its local names. Its flowering season occurs in August and September. Rich woods, thickets, and heavily shaded ground generally are its favorite haunts.

ORANGE HAWKWEED

Hieracium aurantiacum L. Chicory Family [Plate VIII, right]

The orange hawkweed comes from Europe. It has established itself over a range reaching from New Brunswick to Ontario and southward to Pennsylvania, and is variously known as the tawny hawkweed, the golden mouse-ear hawkweed, grim-the-collier, Flora's-paint-brush, and red daisy. Its flowering season begins with June and ends with September.

ZIGZAG BLADDERWORT

Utricularia macrorhiza Le Conte. Bladderwort Family [Plate IX, left]

This bladderwort is found in stagnant water or sluggish streams from Newfoundland to Alaska and southward to Maryland and southern California. Its flowering season is from May to August. The bladders are found on submerged branches and are modified leaves. Leading into each bladder is a door which opens inward but not outward. The creeping insect finds ingress easy and inviting, but escape impossible. The products of its decomposition are absorbed by cross-shaped cells lining the inner surface of the bladder.

PYXIE

Pyxidanthera barbulata Michx. Diapensia Family [Plate IX, middle]

In some sections putting forth its flowers even ahead of the trailing-arbutus, the pyxie is always an early harbinger of spring. The habitat of this plant is generally sandy pine woods, and its range is from New Jersey southward. The genus name comes from two Greek words, the one meaning small box, and the other, anther, and tells us that the anthers of the pyxie are little boxes with lid-like openings.

DANDELION

Leontodon taraxacum L. Chicory Family [Plate IX, right]

Our common dandelion gets its name from the corruption of the French phrase, *dent de lion*, applied to the flower by the Gallic imagination that was able to see, somewhere in its shape, resemblance to a lion's tooth. It is found in fields and waste places in nearly every civilized country, reaching America from Europe only a little later than the first colonists. It yields a milky juice, which in the form of an extract has diuretic and alterative properties.

Its precocious springtime habits, its excellence as greens with a tonic effect, the fun the children have with its stems and puffball heads, tend to excuse it for its intrusion in our lawns, and make it one of the most widely known of all plants.

FLOWERING DOGWOOD

Cornus florida L. Dogwood Family [Plate X]

When Virginia's legislature came to consider the choice of a State flower, a great many people wanted the Virginia creeper—a flower whose very name, wherever it is found, proclaims the Old Dominion. But someone suggested that Virginians were not climbers and

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HAIRY RUELLIA
Ruellia ciliosa Pursh
ACANTHUS FAMILY

WESTERN SPIDERLILY
Hymenocallis occidentalis (Le Conte) Kunth
AMARYLLIS FAMILY

GOLDENCLUB
Orontium aquaticum L.
ARUM FAMILY

© N. G. S.

COMMON AMARANTH
Amaranthus hybridus L.
AMARANTH FAMILY

PEARL EVERLASTING
Anaphalis margaritacea (L.) Benth. & Hook.
ASTER FAMILY

XUM

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DOWNY HAWTHORN
Crataegus mollis (T. & G.) Scheele
APPLE FAMILY
Missouri State Flower

BEGGAR-TICKS
Bidens frondosa L.
ASTER FAMILY

SKUNKCABBAGE
Spathyema foetida (L.) Raf.
ARUM FAMILY

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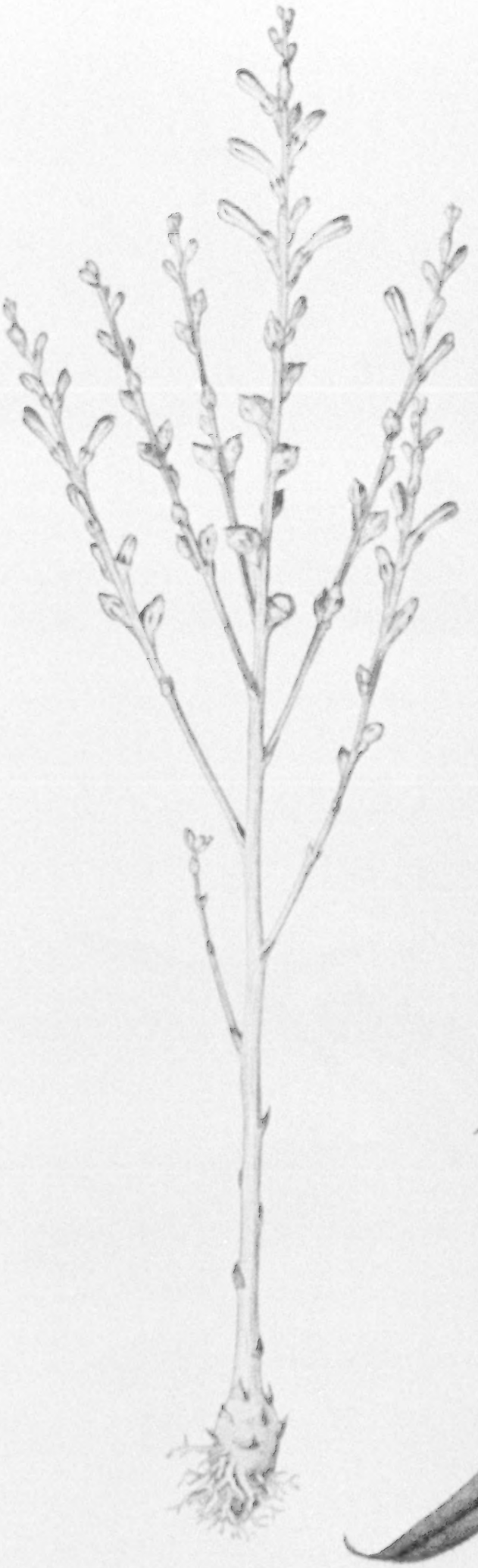

BEECHDROPS
Leptamnium virginianum (L.) Raf.
BROOM-RAPE FAMILY

VIPERS-BUGLOSS
Echium vulgare L.
BORAGE FAMILY

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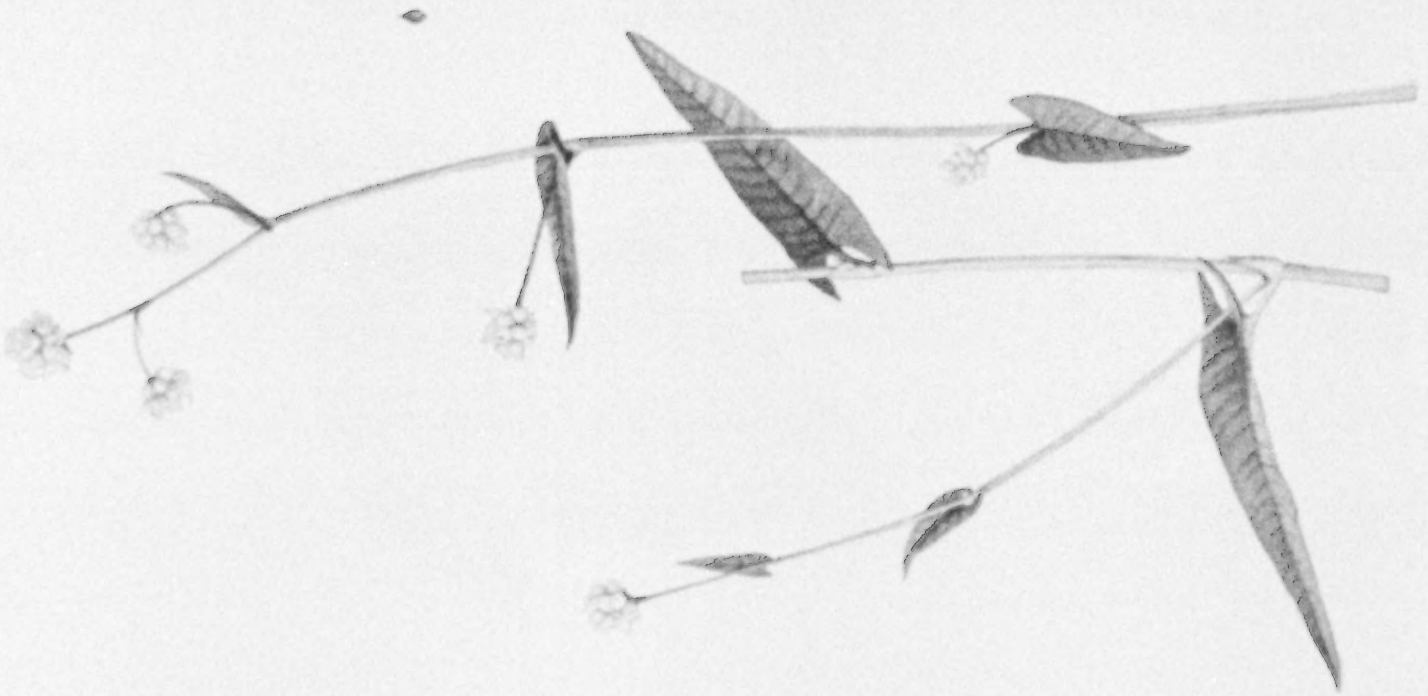
GLOSSY BUCKTHORN
Rhamnus frangula L.
BUCKTHORN FAMILY

DEVILSBIT
Chamaelirium obvale Small
BUNCHFLOWER FAMILY

SPIDERFLOWER
Cleome spinosa L.
CAPER FAMILY



© N. G. S. ARROWLEAF TEAR-THUMB
Tracaulon sagittatum (L.) Small
BUCKWHEAT FAMILY

© N. G. S.

RATTLESNAKE-ROOT
Prenanthes alba L.
CHICORY FAMILY

ORANGE HAWKWEED
Hieracium aurantiacum L.
CHICORY FAMILY

© N. G. S.

ZIGZAG BLADDERWORT
Utricularia macrorhiza Le Conte
BLADDERWORT FAMILY

PYXIE
Pyxidanthera barbulata Michx.
DIAPENSIA FAMILY

DANDELION
Leontodon taraxacum L.
CHICORY FAMILY

© N. G. S.

FLOWERING DOGWOOD
Cornus florida L.
Dogwood Family
Virginia State Flower

©N.G.S.

COMMON SUNDROPS
Oenothera fruticosa L.
Evening-primrose Family

INDIAN PAINTBRUSH
Castilleja coccinea (L.) Spreng.
Figwort Family

HOLMS GERARDIA
Agalinis holmiana (Greene) Pennell
Figwort Family

© N. G. S. HEARTLEAF UMBRELLA-WORT
Allionia nyctaginea Michx.
FOUR O'CLOCK FAMILY

DUTCHMANS-BREECHES
Dicentra cucullaria Bernh.
FUMITORY FAMILY

ROSEGENTIAN
Sabatia angularis (L.) Pursh
GENTIAN FAMILY

XIII

© N. G. S.

DWARF GINSENG
Panax trifolium L.
GINSENG FAMILY

WAX CURRANT
Ribes cereum Douglas
GOOSEBERRY FAMILY

© N. G. S.

LAMBS-QUARTERS
Chenopodium album L.
GOOSEFOOT FAMILY

MOCK-CUCUMBER
Echinocystis lobata T. & G.
GOURD FAMILY

© N. G. S.

FLAME AZALEA
Azalea lutea L.
HEATH FAMILY

RED PINESAP
Hypopitys insignata Bicknell
INDIANPIPE FAMILY

© N. G. S.

HORSETAIL
Equisetum arvense L.
Horsetail Family

ROSEBAY RHODODENDRON
Rhododendron maximum L.
Heath Family
West Virginia State Flower

CAROLINA-JESSAMINE
Gelsemium sempervirens (L.) Ait. f.
Logania Family
South Carolina State Flower

© N. G. S.

PURPLE TRILLIUM
Trillium erectum L.
LILY-OF-THE-VALLEY FAMILY

BLUETS
Houstonia caerulea L.
MADDER FAMILY

COMMON MEADOWBEAUTY
Rhexia virginica L.
MEADOWBEAUTY FAMILY

© N. G. S.

TULIPTREE (Upper)
Liriodendron tulipifera L.
MAGNOLIA FAMILY
Indiana State Flower

FRINGED POLYGALA (Lower)
Polygala paucifolia Willd.
MILKWORT FAMILY

SENSITIVEPLANT
Mimosa pudica L.
MIMOSA FAMILY

COMMON LILAC
Syringa vulgaris L.
OLIVE FAMILY
New Hampshire State Flower

© N.G.S. FOURLEAF MILKWEED
Asclepias quadrifolia Jacq.
MILKWEED FAMILY

© N. G. S.

COMMON HOP
Humulus lupulus L.
NETTLE FAMILY

COMMON CARROT
Daucus carota L.
PARSLEY FAMILY

©N. G. S.

MAYPOP
Passiflora incarnata L.
Passionflower Family
Tennessee State Flower

HOARY TICKCLOVER
Desmodium canescens DC.
Pea Family

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RUGELS PLANTAIN
Plantago rugelii Decne.
PLANTAIN FAMILY

NUTTALLS PONDWEED
Potamogeton epihydrus Raf.
PONDWEED FAMILY

GREAT RAGWEED
Ambrosia trifida L.
RAGWEED FAMILY

XUM

©N.G.S.

COMMON WOODRUSH
Juncoides campestre (L.) Ktze.
RUSH FAMILY

CORALBELLS
Heuchera sanguinea Engelm.
SAXIFRAGE FAMILY

PARTRIDGE PEA
Chamaecrista fasciculata (Michx.) Greene
SENNA FAMILY

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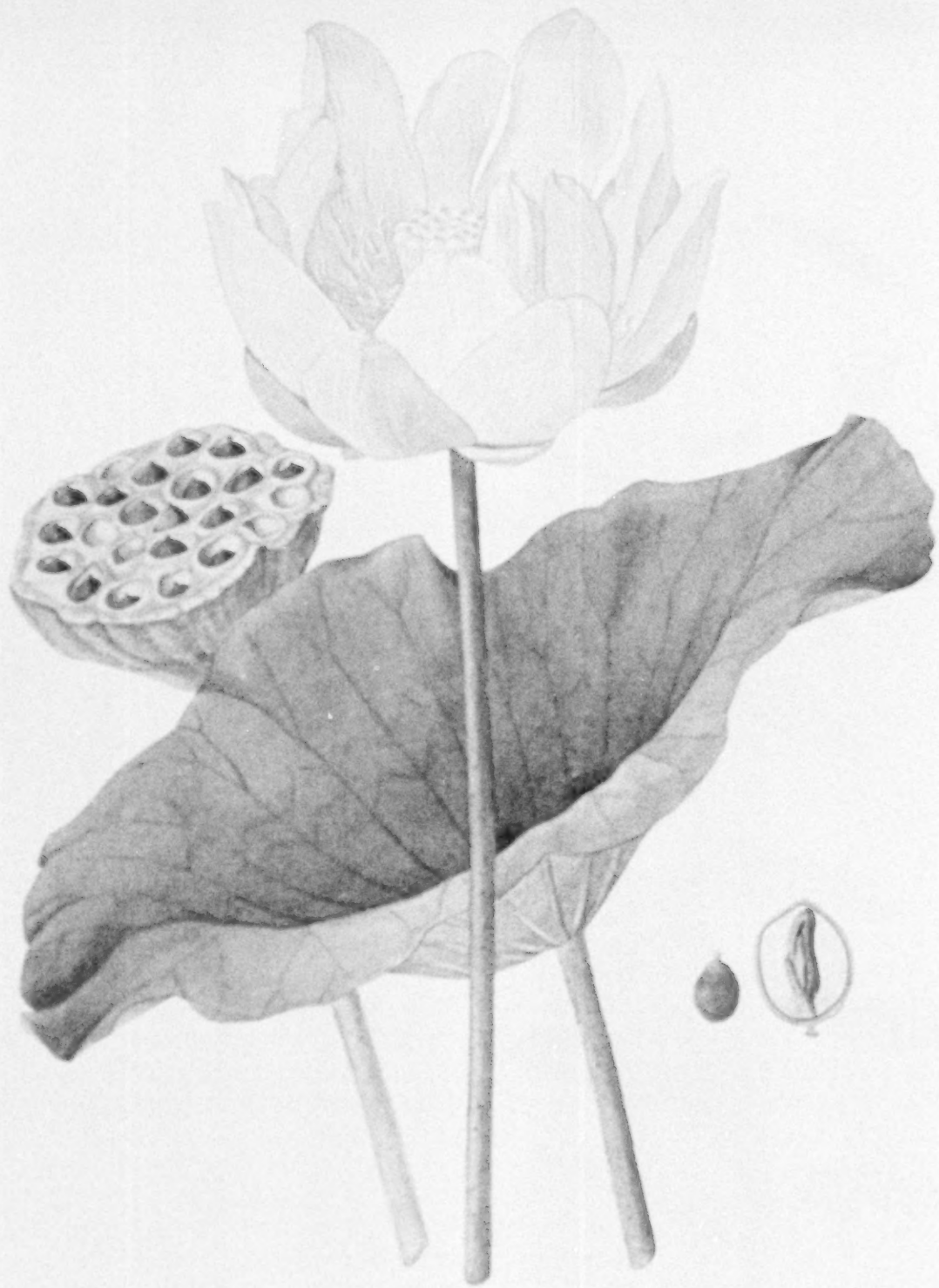
VENUS FLYTRAP
Dionaea muscipula Ellis
SUNDEW FAMILY



AMERICAN LOTUS
Nelumbo lutea (Willd.) Pers.
WATERLILY FAMILY

the Virginia creeper was, and in the deadlock that followed the advocates of the dogwood offered it as a compromise candidate. As it was the second choice of almost everybody, it finally was unanimously chosen. It flourishes from Maine to Florida, and from Ontario to Texas, ascending to the very summit of Virginia's highest mountains. Its blossoms are beautifully white in the spring and its leaves brilliantly red in the autumn. The flowering season runs from April to June.

COMMON SUNDROPS

Oenothera fruticosa L. Evening-primrose Family [Plate XI, left]

This species of the evening-primrose family, called by Britton and Brown *Kneiffia alleni*, by the National Herbarium *Kneiffia fruticosa*, has a wide distribution in the eastern United States, blooming from late May to late August. It is the ancestor, according to Standardized Plant Names, of the cultivated sundrops known as bush sundrops and Young's sundrops. It is a day-blooming species, although belonging to an evening- and night-blooming family, and a field of sundrops is a sight not to be forgotten. They may be kept fresh in vases for a full week.

INDIAN PAINTBRUSH

Castilleja coccinea (L.) Spreng. Figwort Family [Plate XI, middle]

Flourishing in meadows and moist thickets from Maine, Ontario, and Manitoba to North Carolina and Texas, blooming from May to July, and wearing such neighborhood names as red Indians, wickawee, election-posies, bloody-warrior, and nose-bleed, the Indian paintbrush justifies Thoreau's remark that it reminded him of a flame. "It is startling to see a leaf thus brilliantly painted, as if its tip were dipped into some scarlet tincture, surpassing most flowers in intensity of color," he added.

HOLMS GERARDIA

Agalinis holmiana (Greene) Pennell Figwort Family [Plate XI, right]

This is one of a dozen or more species of purple foxgloves found in the United States. It frequents pine barrens, dry woods, and open fields from New Jersey and Florida westward to Texas, and has a blooming period that begins in August and runs to October. It is an annual and grows from one to two feet tall.

HEARTLEAF UMBRELLA-WORT

Allionia nyctaginea Michx. Four-o'clock Family [Plate XII, left]

This umbrella-wort flourishes in dry soil from Manitoba southward to Louisiana and Texas, and as far west as Colorado. It has followed the black-eyed-susan eastward and has reached the environs of Washington, D. C. Growing from one to three feet tall, it puts forth its flowers from May to August, inclusive.

DUTCHMANS-BREECHES

Dicentra cucullaria Bernh. Fumitory Family [Plate XII, middle]

The Dutchmans-breeches gets its English name from its close resemblance to the conventional balloon-legged trousers of the Hollander. Blossoming in April and May, over a range that reaches from Nova Scotia and Minnesota to North Carolina and Kansas, its feathery leaves and delicate, odd-shaped flowers are always attractive. The bumblebees and long-tongued butterflies are its favorite guests, as short-tongued insects cannot sound the depths of its nectar cups.

ROSEGENTIAN

Sabatia angularis (L.) Pursh Gentian Family [Plate XII, right]

This species of gentian occurs in rich soil and thickets over a range that extends from New York to Florida and from western Ontario to Oklahoma and Louisiana. Its flowering time is in July and August. Some of its vernacular names are bitter-bloom, rose-pink, bitter clover, pink-bloom, and American centaury.

DWARF GINSENG

Panax trifolium L. Ginseng Family [Plate XIII, left]

The dwarf ginseng dwells in moist woods and thickets over a range that reaches from Nova Scotia and Ontario and from Georgia to Iowa. Its flowering season runs from April to June. It has a warm aromatic taste and boys roaming the woods like to chew its roots.

WAX CURRANT

Ribes cereum Douglas Gooseberry Family [Plate XIII, right]

This beautiful member of the gooseberry family is one of the many species of currants, and is a close relative of the white-flowered currant, for which it is sometimes mistaken. It is without prickles and its fruit is insipid.

LAMBS-QUARTERS

Chenopodium album L. Goosefoot Family [Plate XIV, left]

This member of the goosefoot family is also known as pigweed, white goosefoot, wild spinach, frost-blite, baconweed, muckweed, and fathen. It is an extremely common weed throughout North America except in northern Canada, and blooms from June to September. Its succulence makes it a favorite of hogs living in pens.

MOCK-CUCUMBER

Echinocystis lobata T. & G. Gourd Family [Plate XIV, right]

Growing along moors and in waste places over an area that reaches from New Brunswick to Manitoba and from Virginia to Texas, and flowering from July to September, the mock-cucumber is mainly an introduced plant in the eastern part of its range. Among its aliases are wild cucumber, wild balsamapple, mock apple, and creeping Jenny.

FLAME AZALEA

Azalea lutea L. Heath Family [Plate XV, left]

With a range that reaches from New York to Georgia and a flowering season that begins in May and ends in June, the flame azalea sometimes masquerades under the misnomer yellow honeysuckle. It is a beautiful and showy species and has been brought under cultivation with much success. So well does it respond to pampering that its finest, showiest flowers are produced by cultivation. It possesses little fragrance.

RED PINESAP

Hypopitys insignata Bicknell Indianpipe Family [Plate XV, right]

The red pinesap has a wide range in the eastern United States and Canada, and flourishes especially in or near mountains, where it can find shelter and humus under fir, beech, and oak trees. Its flowering season is from June to October. By refusing to go out and dig in the soil for its own living, and by insisting on preying upon dead vegetation to get its nourishment, the pinesap has received the brand of the Cain of the vegetable world. No plants that depend wholly on other plants, whether alive or dead, for their food can wear the green livery of the respectable flower world. Chlorophyll refuses to form in their tissues, and so they have to go up and down the earth wearing the badge of their depravity. The pinesap blossoms have a fringe of hairs radiating from their styles, and these form a stockade against insect pilferers.

HORSETAIL

Equisetum arvense L. Horsetail Family [Plate XVI, left]

This representative species of the horsetail family flourishes in sandy soil, especially along roadsides and railways from Greenland to Alaska and southward to Virginia and California. It also is found in Europe. In Virginia it climbs the mountain sides to an elevation of 2,500 feet. Numerous aliases testify to its wide distribution. These include cornfield horsetail, bottlebrush, snake-pipes, and cats-tail. The flowering season of this best-known survivor of a great antediluvian race is May.

ROSEBAY RHODODENDRON

Rhododendron maximum L. Heath Family [Plate XVI, middle]

The superb beauty of the rhododendron has won for it universal admiration and the distinction of being the State flower of two commonwealths. The legislature of West Virginia and the State organization of women's clubs in Washington have elevated it above all other floral rivals in their communities. The chosen variety of West Virginia is *Rhododendron maximum*, while that of Washington is *Rhododendron californicum*, also called the coast rhododendron. The latter is the most splendid of western shrubs. Both of these species have delicate, waxen blossoms tinted like the "rosy-fingered dawn," with upper petals flecked with golden and greenish spots.

The rhododendron has no clever trick of showering its pollen upon insect visitors like the mountain-laurel, but it protects itself by exuding a sticky substance below the flower to shield the blossoms from ants and crawling insects that do not transfer pollen. The bee and other insect friends of the rhododendron find its nectar very appetizing, but the honey they make from it is said to be poisonous.

CAROLINA-JESSAMINE

Gelsemium sempervirens (L.) Ait. f. Logania Family [Plate XVI, right]

When South Carolina selected a flower for the national bouquet, she chose the Carolina-jessamine. As the sole American representative of the *Gelsemium* branch of the family, the Carolina-jessamine is admirably fitted for the rôle assigned, as to name, fragrance, and appearance. It flourishes in woods and thickets from eastern Virginia to Florida and west and southward to Texas, Mexico, and Guatemala. Its flowering season is from March to October, and among its incognitos are Carolina wild woodbine and evening trumpetflower. Its stem is slender, trailing or climbing, and sometimes reaches a length of 20 feet.

PURPLE TRILLIUM

Trillium erectum L. Lilly-of-the-valley Family [Plate XVII, left]

The purple trillium, inhabiting rich, moist woodlands, flourishes from Nova Scotia to North Carolina and westward to Manitoba and Missouri. Its flowering season is from April to June. Unfortunately its character does not measure up to its attractive name, for it has chosen to cater to the flesh flies rather than to the butterflies and bees. Its flowers have come to look something like raw meat and their odor to approximate that of decaying flesh. Hence its vernacular name—ill-scented wakerobin.

BLUETS

Houstonia caerulea L. Madder Family [Plate XVII, middle]

The bluet lends its beauty to a geographical area including eastern Canada and southern Georgia and Alabama, reaching as far west as Michigan. Moist meadows and the banks of streams form its favorite environment. Its flowering season includes late April to late July, and a few come out even in the dogdays of August.

A long list of local pseudonyms proclaims how thoroughly this bluet has laid hold on the popular imagination. Some of these are quaker-ladies, Venuspride, innocence, angel-eyes, blue-eyed-babies, little washerwomen, and eyebrights.

The flowers appear in two varieties, some with a blue matching that of the cloudless sky and others with a white rivaling the snow. Indeed, a field decked with the latter looks as if it had received a tiny blanket of powdery snow.

This little bluet puts forth flowers of two structural forms. In the one the stamens remain in the lower part of the corolla tube and the pistils are extruded. In the other the stigmas remain below and the stamens are extruded.

But the two are not found mixed, for each produces after its own kind.

Many insects visit the bluets, but the small bees and the smaller butterflies are their most frequent guests. The common little meadow fritillary is always a busy little creature in its commerce with the bluets when they are in bloom.

COMMON MEADOWBEAUTY

Rhexia virginica L. Meadowbeauty Family [Plate XVII, right]

A stout-stemmed perennial, which blossoms from July to September, over a range that reaches from Maine and Ontario to Florida and Louisiana, the common meadowbeauty is the best known member of its family in our latitude. It flourishes in sandy swamps, and its special insect customers seem to be the yellow butterfly and the honeybee. Possessed of the fine, fragile beauty that proclaims its tropical relationships, the meadowbeauty reminds one of the scarlet evening-primrose. A bright patch of these delicate, deep-hued flowers is always a delight to the eye, and even when the flowers are gone the scarlet leaves make a striking substitute for them. Thoreau, writing of the meadowbeauty, says: "The scarlet leaves and stems of the *rhexia*, some time out of flower, make almost as bright a patch in the meadows now as the flowers did. Its seed-vessels are perfect little cream-pitchers of graceful form."

TULIPTREE

Liriodendron tulipifera L. Magnolia Family [Plate XVIII, upper]

Indiana's legislature years ago declared the pink carnation the Hoosier State flower. But as the years went by our Hoosier friends had a change of heart and deposed this fragrant blossom and enthroned the tuliptree—the only State in the Union that has ever deposed a legally acknowledged flower queen.

Variously known as the lime-tree, blue-, white-, or yellow-poplar, lynntree, saddletree, basswood, hickory-poplar, tulip-poplar, saddle-leaf, and canoe-wood, the tuliptree has a range that reaches from Vermont to Florida and from Michigan to Arkansas and Mississippi, occurring mostly in woodlands and flowering in May and June. It is a magnificent tree, frequently attaining a height of 190 feet.

FRINGED POLYGALA

Polygala paucifolia Willd. Milkwort Family [Plate XVIII, lower]

The fringed polygala dwells in moist, rich woods throughout a range whose northern limits include New Brunswick and Saskatchewan and whose southern boundary includes Georgia. It gets as far west as Minnesota. Flowering wintergreen, gay-wings, baby's-toes, little pollom, and bird-on-the-wing are some of its vernacular names. Its flowering season begins in May and usually ends in July.

When a bumblebee alights on the lower petal of the fringed polygala her weight so depresses the tubular petals that protect the stamens and pistil from rain, dew, and useless insects that the spoon-tipped pistil is forced out. It pushes the pollen deposited by the anthers outward and onto the breast of the bee. The stigmatic surface of the pistil is on the opposite side of the spoon from that which comes into contact with the pollen of the flower's own anthers. Then, as the bumblebee inserts her tongue into the nectar jar, some of the pollen from a previously visited flower adheres to the sticky surface of the pistil.

FOURLEAF MILKWEED

Asclepias quadrifolia Jacq. Milkweed Family [Plate XIX, left]

This member of the milkweed family puts forth its blossoms in May, June, and July. Its range is from Maine and Ontario on the north to Alabama and Arkansas on the south. It occurs in woods and thickets usually. When one comes to examine the blossom with a magnifying glass he will perceive that the row of bodies which may casually be taken for stamens are in reality tubular bodies colored like petals, containing a curved, needlelike hook. The little tubes serve as hoods for the tiny hooks. Remove both the hoods and their hooks and the stamens will be revealed united into a tube standing around the pistil. The pollen in the anthers terminating the several stamens, instead of being in the form of grains, is in a long, flat, yellow mass.

COMMON LILAC

Syringa vulgaris L. Olive Family [Plate XIX, middle]

New Hampshire, by legislative act, recently selected a State flower, and everybody will applaud the choice of the common or purple lilac to represent it in the national family of official flowers. It is an escape from gardens to roadsides, and its range is from Maine to Virginia and westward. A native of eastern Europe, it was long ago brought to America by our flower-loving ancestors, and is supposed to have been taken to Vienna from Persia in the 16th century.

The several species of lilac cultivated in America usually have purplish or white flowers, and are valued for park and garden planting because of their hardiness and free-blooming

qualities. The wood of larger specimens is prized by cabinetmakers for turning and inlaying. The lilacs thrive best in deep, rich soil, but survive almost anywhere. They have a habit of growing suckers, of which advantage is taken in propagating. They may also be propagated by cuttings and by grafting on privet.

SENSITIVEPLANT

Mimosa pudica L. Mimosa Family [Plate XIX, right]

The sensitiveplant of our hothouses and Gulf States is a native of tropical America, but has been naturalized in corresponding latitudes in Asia and Africa. Shelley's famous poem "The Sensitive Plant" refers to this species of *Mimosa*. Its wide cultivation is due partly to the beauty of its bipennate foliage, but mainly to its sleepy movements and response to mechanical irritation. Light and darkness will cause it to wake or sleep; but even when touched the leaves will begin to assume an air of innocence and fold up. Shake the plant and not only do the leaves fold themselves but droop as well. But if the shaking be continued they seem to recover from the shock, open again and pay no further attention to the disturbance.

COMMON HOP

Humulus lupulus L. Nettle Family [Plate XX, left]

The common hop grows wild in thickets and on river banks from Nova Scotia and Manitoba to Georgia and New Mexico. It is an escape from cultivation. The flowering season is July and August and its seeds are ripe in September and October.

The hop, which is of great importance to the brewing industry, has been grown so long from cuttings that it has lost its ability to come true from seed, and such seeds as it does produce when male plants are grown are usually incapable of reproducing the plant. The cuttings are made from the underground stems. Varieties imported from Bohemia produce no male plants and it is said that they yield more hop meal than the varieties from which the male of the species have not been entirely eliminated.

The enactment of national prohibition has been a blow to hop culture in the United States. In 1913 this country produced 62,000,000 pounds of hops out of a total of 173,000,000 pounds for the whole world—or nearly 40 per cent of the total crop.

COMMON CARROT

Daucus carota L. Parsley Family [Plate XX, right]

Making itself a great nuisance to the farmer, and to the horses and cattle that eat the hay and grass into which it has intruded, the common carrot came from Europe. It has established itself throughout almost the entire United States. As the ancestor of the table carrot much can be forgiven it. The wide distribution of this far-flung colonizer may be gathered by the number of aliases under which it passes in various parts of the country, such as bird's-nest, Queen Anne's-lace, laceflower, devil's-plague, and rantipole. Flowering from June to September, the blossoms of the carrot are lacy and attractive when in their prime, but as the frosts come they take on a careworn, disheveled appearance that makes them anything but beautiful.

The domestication of the carrot dates back to a period beyond historical times. Pliny reports that the finest specimens were brought to Rome from Candia. It is supposed to have been taken to England by the Dutch in the reign of Queen Elizabeth. In the writings of Parkinson it is related that the ladies wore carrot leaves instead of feathers in their hair at balls and banquets.

MAYPOP

Passiflora incarnata L. Passionflower Family [Plate XXI, left]

The State Horticultural Society has voted in favor of the maypop, or passionflower, as the State flower of Tennessee. The selection seems to be a popular one, and it has been given at least semiofficial recognition.

A climbing vine, sometimes attaining a height of 30 feet, the maypop flowers from May to July over a territory that reaches from Virginia and Missouri to Florida and Texas. The fruit, which is as large as a hen's egg, is a berry which becomes lemon-colored when ripe. The pulp is white and of a peculiar sweetish flavor that one either likes or dislikes very much.

HOARY TICKCLOVER

Desmodium canescens DC. Pea Family [Plate XXI, right]

The hoary tickclover, sometimes known as the hoary tick-trefoil, has a range that reaches from Ontario to Massachusetts and Florida, and westward to Minnesota and Texas. It prefers rich soils for its environment, and is in flower from July to September. In the tickclover we have another example of the way various families of plants undergo parallel evolution. The beggar-ticks and the Spanish needles succeed in sending their colonies abroad by attaching little hooks to their seeds. These fasten in the hair or wool of passing animals, or on the clothing of man, and thus employ animal transport in their colonization schemes. The tickclovers have developed the same method of sending their children away from the home rooftree, as it were, and with marked success.

RUGELS PLANTAIN

Plantago rugeli Decne. Plantain Family [Plate XXII, left]

This plantain resembles the common plantain, *Plantago major*, which is perhaps the best

known of the broad-leaved species. Its spikes are a little less dense, at least toward the base, and its leaves are a little thinner and of a brighter green. But otherwise the differences that make them two species instead of one would escape the eye of the layman.

Rugels plantain is found from New Brunswick and Ontario southward to Florida and Texas. Its flowering season is from June to September.

The common plantain flowers from May to September and has a range that includes nearly all North America and the West Indies. The Indians called the two species white-man's-foot.

NUTTALLS PONDWEED

Potamogeton epihydrus Raf. Pondweed Family [Plate XXII, middle]

This species of pondweed is found in ponds and streams from Newfoundland to British Columbia and southward to North Carolina and Iowa. Its flowering season is from June to August.

GREAT RAGWEED

Ambrosia trifida L. Ragweed Family [Plate XXII, right]

The great ragweed is sometimes known as horse-cane and bitterweed. It flourishes from Quebec and Manitoba to Florida and New Mexico. Since its pollen has an irritating effect on the mucous membranes of so many human noses, it has received the name hay-fever weed.

COMMON WOODRUSH

Juncoides campestre (L.) Ktze. Rush Family [Plate XXIII, left]

This species of rush occurs in woodlands throughout the United States and Canada, and is also indigenous to Asia and Europe. It bears many common names, among them, sweeps, chimney-sweeps, black-caps, cuckoo-grass, and good-Friday. This species is fairly typical of the whole family, except that some of the others do not have tufted stalks.

VENUS FLYTRAP

Dionaea muscipula Ellis. Sundew Family [Plate XXIV, left]

Charles Darwin once wrote that he considered the Venus flytrap "the most wonderful plant in the world," and anyone who studies its behavior will doubtless agree with his verdict. It is found on the coast of the Carolinas in very limited areas. The edges of the leaves bear a series of little spikes and the slightly concave surface of each leaf half bears three or more fine, tapering bristles, hair triggers, as it were, to set off the trap. Touch one of these hair triggers twice or two of them once, and immediately the leaf closes, the spikes at the two edges interlace, and you will see how the plant takes and retains its prisoners.

The trap is baited with sweets that are especially tempting to insects. When they spring it and are caught they are held lightly for the time being, as if the flytrap were debating the edibility of the catch. If the prisoner be too small for a good morsel, or a bit of nonnutritive matter, the trap will open and the prisoner be released. But if it be edible and nutritious, the trap closes down so rigidly that one can see the impression of the insect body through the leaf. Struggling to escape boots the prisoner nothing, for the harder the struggle the tighter the flytrap's hold.

The leaf secretes a digestive ferment, and with this it breaks up and absorbs the tissues of the erstwhile unwilling guest. When only the chitinous parts remain the leaf opens up again, casts out the "bones" of its feast, and sets its trap for the next victim.

CORALBELLS

Heuchera sanguinea Engelm. Saxifrage Family [Plate XXIII, middle]

The coralbells belong to the genus *Heuchera*, of the saxifrage family. It very closely resembles its cousin *Heuchera americana*, the alumroot, which is the type species of the genus. Most of the species of *Heuchera* are essentially Mississippi Valley plants, although a few of them are found on the Atlantic seaboard. The flowering time of the coralbells and the other members of this genus is May and June.

PARTRIDGE PEA

Chamaecrista fasciculata (Michx.) Greene Senna Family [Plate XXIII, right]

The partridge pea, locally known as the large-flowered sensitive pea, dwarf-cassia, and magoty-boy-bean, flourishes in dry soil from Massachusetts to Florida and westward to Minnesota and Mexico. It is an annual, sometimes spreading and sometimes erect, and flowers from July to September. Its behavior and appearance both remind one of the sensitiveplant of the mimosa family.

AMERICAN LOTUS

Nelumbo lutea (Willd.) Pers. Waterlily Family [Plate XXIV, right]

This species, sometimes known as the water-chinkapin, sometimes as duck-acorn, and sometimes as the wankapin, lives in rivers and lakes from Massachusetts to Cuba and from Minnesota to Louisiana. The tubers and seeds are farinaceous and edible. It is a close relative of the Hindu lotus, which serves many useful purposes in the East. The filaments of the Hindu species are astringent and cooling, and are used in the treatment of burns, the leaves are used as bed sheets for fever patients; a sherbet made from it is given to smallpox patients as a refrigerant.

An early number of the NATIONAL GEOGRAPHIC MAGAZINE will contain 32 pages of illustrations in full color of 200 Wild Flowers of California and other Western States.

Photograph by Alexander Wetmore

THE LANDING ROCK ON NIHOA (SEE PAGE 77)

In modern times few persons have succeeded in getting safely ashore on this rugged island, 270 miles from Honolulu. The landing of men, food, and equipment for scientific work required judgment and skill on the part of the officers and men of the *Tanager*. It was safe to approach the landing rock only as the surf welled slowly in, when bundles were tossed to the man on the rock and passed up the waiting line behind, while the surfboat backed away to safety. At frequent intervals huge waves, threatening destruction, broke over the party, submerging the entire rock shelf. On this island the expedition found the saucy Nihoa Finch (not a true Finch, but a strong-billed member of the curious Hawaiian family *Drepanididæ*) and a Millerbird, a form new to science, both species being restricted to this barren rock and found nowhere else in the world.

BIRD LIFE AMONG LAVA ROCK AND CORAL SAND

The Chronicle of a Scientific Expedition to Little-known Islands of Hawaii

By Alexander Wetmore

Assistant Secretary, Smithsonian Institution

With Illustrations from Photographs by Donald R. Dickey and the Author

WHEN the United States annexed Hawaii, in addition to the eight large, inhabited islands* that form the territory as the tourist sees it, a chain of islets that extend from the main group toward the northwest for more than 1,300 miles was also acquired (see map, page 79). Uninhabited by man, except for a cable station at Midway, these have been little known. In 1909, through the interest of former President Roosevelt, these Leeward Islands of the Hawaiian group were set aside as the Hawaiian Bird Reservation, and placed under control of the Biological Survey of the United States Department of Agriculture.

From time to time parties have visited Laysan, an important bird rookery, to study its wonderful bird life, and perhaps en route have landed for a few hours at one or two other points. On the whole, however, the group, from a scientific standpoint, has been unexplored.

Early in 1923 arrangement was made with the Navy Department for transportation and other assistance, and a cooperative expedition was organized by the Biological Survey and the Bishop Museum, of Honolulu, for a complete scientific exploration of these outlying islands. On April 4 a party of 12 left Honolulu on a thousand-ton Naval mine sweeper, the U. S. S. *Tanager,* for a four months' cruise.

Our party included a botanist, an entomologist, a geologist, a conchologist, an ornithologist, one or more collectors of fishes, miscellaneous marine animals, and plants, students of ruins left by man, a topographer, and one or two general assistants.

All had cameras, and, in addition, Mr. Donald R. Dickey, of Pasadena, Calif., an expert in motion and still photography of birds, accompanied the party to Laysan Island. As the representative of the Biological Survey, the direction of the work of the scientific party fell to me.

RELICS OF A VANISHED POLYNESIAN COLONY FOUND ON NIHOA

Though rough and inhospitable to the voyager (see page 76), the first island in the chain, Nihoa, proved of great interest.

Polynesians once had a colony of several hundred persons here. Level house platforms made of flattened stones rose one above the other in a little valley that, during rains, evidently contained water.

The steep slopes, now clothed with bushes, had been terraced with great labor to permit cultivation of the sweet potato and dry land taro, and a cave or two showed signs of ancient occupancy. In our excursions over the slopes we found a number of stone bowls fashioned from porous volcanic rock.

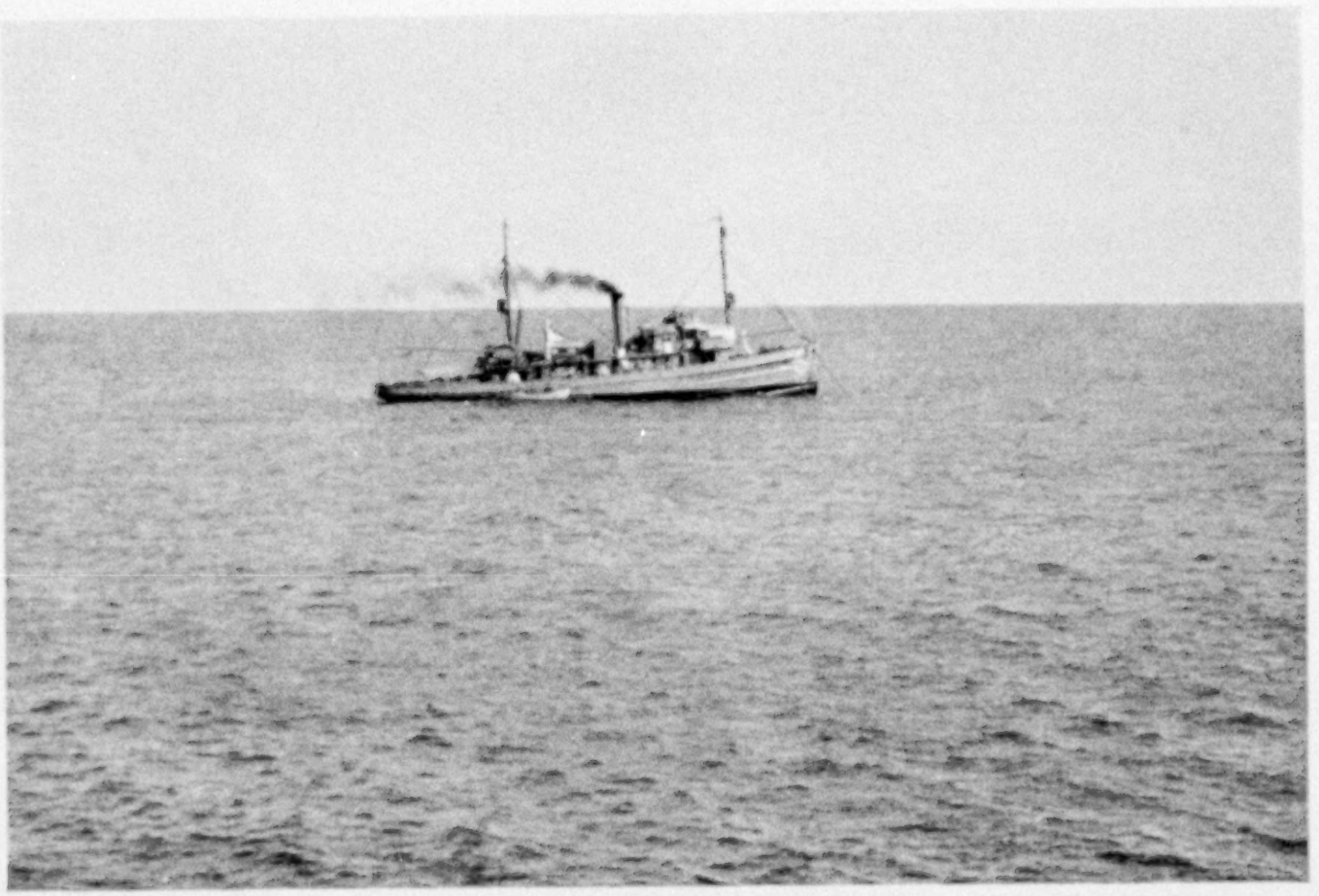
Legend runs that in early times a fisherman living on Nihoa had a beautiful daughter, desired by a prince of Kauai. When the latter came to claim her, the girl ran up the steep cliff paths, the prince in pursuit. At the ragged border of the *pali* (cliff) she stopped and cried: "If you touch me I shall jump." But the prince, unable to control his ardor, stretched out his hand to seize her.

Instantly the girl sprang to her destruction, while the prince was turned to a leaning stone, which still stands on the brink of the precipice, where it may be viewed in corroboration of the story!

Small groves of a slender palm grew in some of the gulches, while a scrubby, woody-stemmed plant allied to our common lamb's-quarters clothed the slopes.

In these were flocks of the saucy Nihoa

*See "The Hawaiian Islands," by Gilbert Grosvenor, LL. D., in the National Geographic Magazine for February, 1924.



Photograph by Alexander Wetmore

THE U. S. S. "TANAGER" AT ANCHOR OFF NECKER ISLAND

This thousand-ton ship of the mine-sweeper class played an important part in laying the mine barrage in the North Sea. In 1923 the *Tanager* was assigned by the Navy Department to transport a party of scientists from the Biological Survey, United States Department of Agriculture, and the Bishop Museum of Honolulu during an extended exploration of islands in the Hawaiian Bird Reservation.

Finch (not a true Finch, but a strong-billed member of the curious Hawaiian family Drepanididæ) and an occasional Millerbird (a form new to science), both species restricted in range to this barren rock, and found nowhere else in the world.

Hordes of Terns nested on the slopes, Boobies and Frigate Birds formed colonies in the bushes, and beautiful snow-white Love Birds nested in pairs on tiny ledges on the huge black cliffs. Albatrosses, found elsewhere near the sea, here nested on a flat 850 feet above the waves.

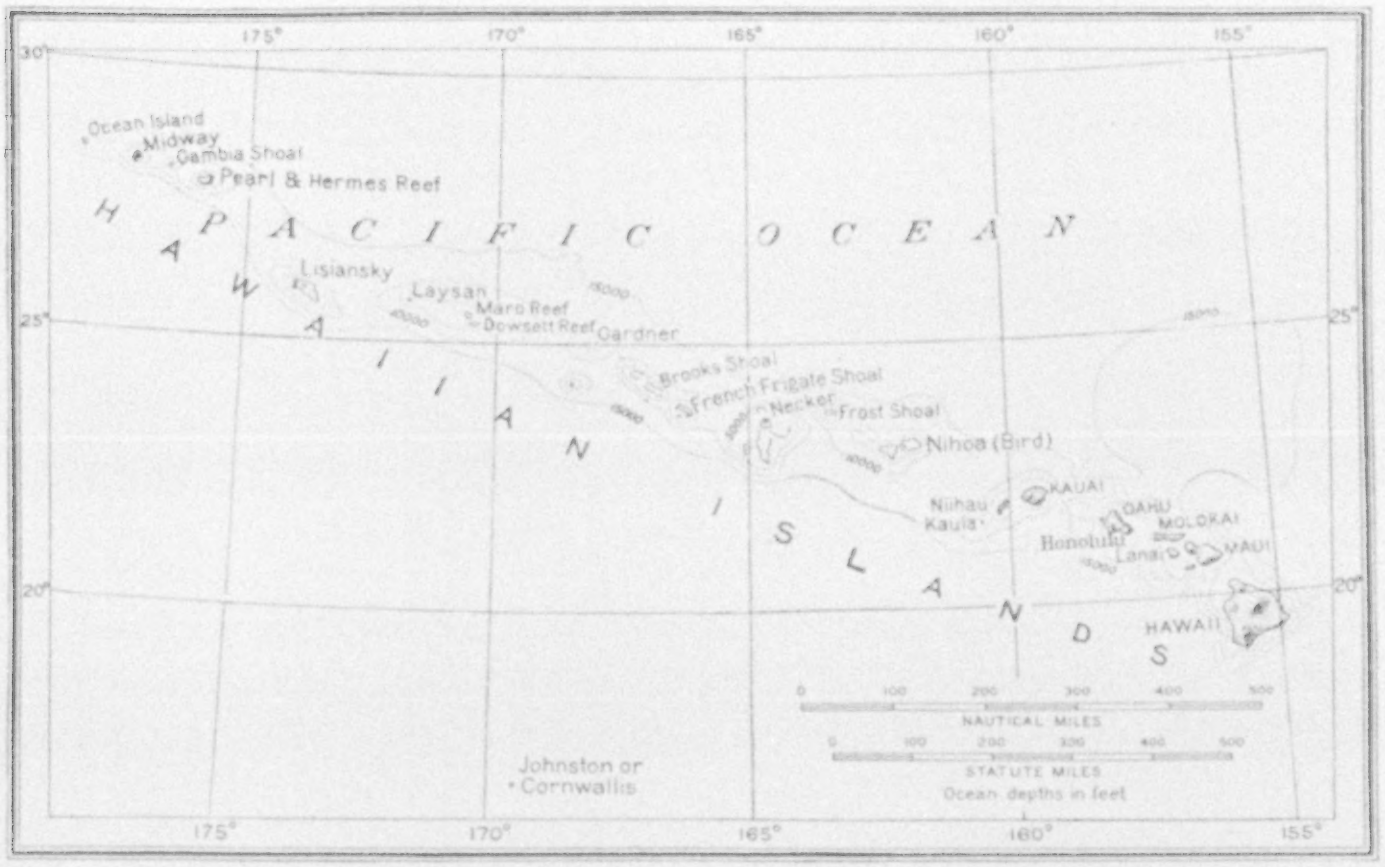
NECKER IS AN ISLAND OF MYSTERY

On November 4, 1786, the Frenchman La Pérouse sighted a rough, barren rock, west of the main Hawaiian group, which he named Necker Island in honor of the Swiss banker Jacques Necker, who at the time was busy in France with a futile attempt to stabilize the uncertain exchequer of an uneasy government. Though the French exploring expedition remained in the vicinity of this rock for a brief time, no attempt was made to land, and the journal of La Pérouse comments mainly on the barrenness of the place.

From a distance Necker, where we had proceeded after completing work on Nihoa, appears as some misshapen, monstrous animal crouched amid the waves.

Though landing was simple, location of camp was difficult. We found a protected shelf 40 feet from the water, on which to tie the cook tent, while rough ledges above, partly protected by the overhanging cliff, furnished smaller platforms where the members of the shore party distributed their cots and scientific apparatus as best they might (see page 80). My own sleeping quarters were fully 70 feet above the water. We roosted at night like so many sparrows. Never have I occupied a rougher spot for a camp.

Nihoa was well known to the ancient Hawaiians, but Necker had no known native name, nor does it figure in the



Drawn by A. H. Bumstead

A MAP OF THE HAWAIIAN ISLANDS

In addition to the eight principal islands of the Hawaiian group (Hawaii, Maui, Kahoolawe, Lanai, Molokai, Oahu, Kauai, and Niihau), a chain of islets extends to the northwest for more than 1,300 miles. Of the latter, Nihoa, Necker, French Frigate Shoal, Gardner, Dowsett and Maro Reefs, Laysan, Lisiansky, Pearl and Hermes Reef, Midway and Ocean Islands were studied by the *Tanager* Expedition, led by Dr. Alexander Wetmore.

many legends of that people. There are found, however, on this isolated bit of rock, far below the horizon from distant Nihoa, many signs of occupancy by ancient, more or less primitive man.

A wonderful series of more than 40 *heiaus*, or stone temple platforms, rectangular in form, ranging from a few feet to 60 feet in length by half as wide, were found on the higher points of the island.

The floors of these ancient temples were smooth, except where a raised platform two or three feet wide had been constructed to a height of 12 or 15 inches across one of the long sides. At regular intervals along its back were blocks of stone a foot or more wide by three or four feet high.

That the platforms were ancient temples is shown by the discovery 30 years ago of crude stone idols, that lay prostrate where they had fallen from the erect border stones. Many of these were destroyed through the mistaken Christian zeal of a royal edict, but fortunately a few have been preserved in museums.

In addition to the temple ruins, small shelter caves scattered over the sloping cliffs were found to contain occasional bits of stone bowls, a low retaining wall to level the floor, or the remains of a primitive fireplace.

NECKER MAY HAVE BEEN A POLYNESIAN PLACE OF PILGRIMAGE

There is on Necker no dependable water supply, nor are there food resources or sufficient space for the support of a permanent population. Obviously, then, worshipers came from a distance, possibly from Nihoa, perhaps from the formerly populous Napali cliffs of the island of Kauai.

May we not suppose that here flourished an ancient religion, followed in later years by a few initiates who kept alive on this remote rock altar fires of a cult whose sacred name was unknown to the general populace—a religion whose rites were so fearsome or so holy to the devo-

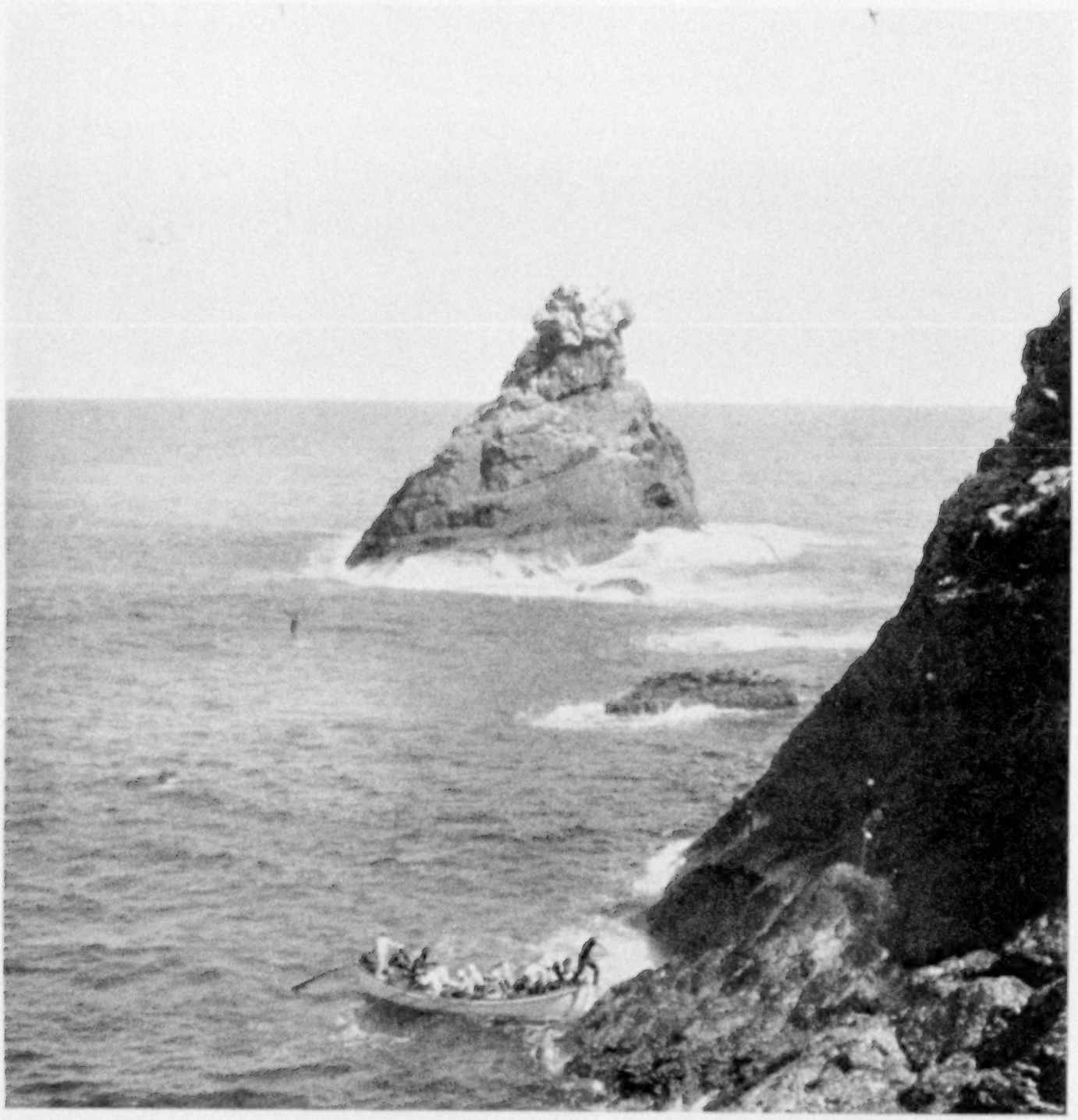
THE HEIAUS OR TEMPLES ON NECKER, NOW FREQUENTED ONLY BY BIRDS

Large upright stones stand on a raised shelf built at the back of each level platform. The birds in the photograph are young Laysan and Black-footed Albatrosses, with a young Blue-faced Booby in the center.

Photographs by Alexander Wetmore

THE WESTERN END OF NECKER ISLAND

Camp for the author's shore party was established on the cliff at the left, above the landing ledge. The two tents were used for cooking and storage. The men worked and slept on the small ledges above, wherever there was room for a cot or collecting equipment (see page 78).



Photograph by Alexander Wetmore

A LANDING ON THE ROUGH SHORE LINE OF GARDNER ISLAND

The amount of rise and fall of the waves may be judged from the surf on the rock in the background. To negotiate these landings successfully requires skill and experience on the part of steersman and boat's crew.

tees as to preclude their celebration in public, or their mention in story, so that with the decadence of the older people all knowledge of their form has disappeared?

Such ponderings are appropriate as one reclines at dusk on a rocky ledge high above the sea, with the wash and crash of waves as a background for the mosaic of sounds formed by the yelping of Terns, the croaking of circling Boobies, and the soft barking notes of gentle Petrels among the rock crevices; or when one awakens as the first rays of dawn touch the clouds at the horizon, and untold thousands of Terns, as if at a preconcerted signal, rush out from the rocks in a vast cloud to greet approaching day.

Neither here nor on Nihoa did the *Tanager* party discover ancient human burials whose bones might aid in revealing who the early visitors to the islands were.

From Necker we continued west for a

Photograph by Alexander Wetmore

THE BLACK-FOOTED ALBATROSS FEEDS HER YOUNG BY REGURGITATION

This bird is the dark-colored "Gooney" that follows in the wake of trans-Pacific steamers. On their breeding grounds they live almost entirely upon small squid taken at sea.

brief stay among the 13 sand islands and the pinnacle rock that mark French Frigate Shoal. Beyond lies Gardner Island, an inaccessible rock, according to the United States Coast Pilot. If others had effected a landing here before our visit, there is apparently no record of the fact. The main rock, only 200 yards long, is composed of two peaks, the highest rising 170 feet, with a deep cleft between. A smaller rock is separated from the first by a narrow strip of water.

BIRDS WITH SAW-EDGED BILLS BITE EXPLORERS

We found only a single species of plant on this island, a fleshy-leaved form restricted to a handful of individuals, though I saw a good many heavy-spined seeds of a creeper (*Tribulus cistoides*) that grows commonly on low sand islands. These probably were brought here in the feet or plumage of sea birds that had come from Laysan or French Frigate Shoal. Though dropped on a barren rock without sufficient soil for their growth, they served to illustrate how such spiny plants are transported to lonely islands.

Terns of five species rested both on the gentler slopes and on the steep ledges. Tropic Birds nested in holes below the summit, and the whole upper third of the island was given over to the Blue-faced Boobies, now on guard over their well-grown young.

These snow-white Boobies were as large as geese, and it was necessary to drive the squalling adults ahead of us, for when we passed them quietly they had a way of waddling up behind us and biting savagely with their heavy saw-edged bills. Their attack was often disturbing when one was picking a precarious path along some narrow ledge.

LAYSAN, THE ALBATROSS METROPOLIS

Traveling west from Gardner Island, one soon comes to Dowsett and Maro Reefs, named from ancient shipwrecks. These are mere coral rings marked by breakers and without visible land. Then,

Photograph by Alexander Wetmore

FRIGATE BIRDS, KNOWN ALSO AS MAN-OF-WAR BIRDS, SWOOPING DOWN TO SEIZE FISH CAST IN THE AIR

These great birds are piratical in habit; they feed largely on squid or fish taken forcibly from Boobies, Terns, or Shearwaters.

Photograph by Donald R. Dickey

A BIRD IN THE HAND

Steward George, of the *Tanager*, remonstrated daily with a certain Red-tailed Tropic Bird against its determination to make a nest in the cook shack, back of a case of Navy rations. To the end of a three weeks' stay on Laysan Island, George remained gentle; the Tropic Bird adamant, tame and broody! So, it is hoped that this bird forgave the party the bustle and clatter incident to the preparation and dispatch of sundry turtle stews, and that subsequently it raised its single youngster in the shade it sought.

over the horizon, beyond the dangerous jaws of these hidden traps, comes Laysan Island, 855 nautical miles from Honolulu.

Ever since its discovery, Laysan has been famed for its sea birds. Pilot books and the logs of navigators through these waters describe their hordes, and even the Hydrographic Office charts depict the low elevation of Laysan, with the air above filled with birds. Though only a mile and three-quarters long and a mile wide, it is the most pretentious of the islets in the Leeward chain.

An elevated rim, rising somewhat abruptly from the beach line to a height of 20 to 40 feet, incloses a shallow, oblong basin, in whose center is a saline lagoon with waters concentrated by evaporation under a blazing sun, until they are far more heavily charged with salt than the sea itself.

Photograph by Alexander Wetmore

A CAST OF THE NET

A sheath knife is usually worn by swimmers in the waters adjacent to Laysan Island as a protection against sharks.

At an early date it was discovered that there were valuable deposits of guano on Laysan, or Moller, as it was then known, and for some years the island was of considerable commercial importance.

The nineties of the last century marked the height of the guano industry. A gradual decline began in 1900, and by 1908 shipments had ceased and the island was practically deserted, leaving a number of frame buildings clustered about the landing, a few hundred yards of rails laid across the sand, and three or four scattered piles of phosphatic rock dug out for shipment and then abandoned.

Through all these years Laysan had been literally covered by myriad sea birds, while the grass and shrubbery that clothed the island harbored five species of land birds restricted to its less than two square miles and known nowhere else in the world in a native state. These included a tiny flightless rail, a species of duck, a warbler, known as the Millerbird, and two species of Drepanididæ (see also text, page 78), one as large as a sparrow, with strong robust bill, known as the Laysan Finch, or "Canary," and the other smaller, with slender beak, the Laysan Honey Eater, called from its coloration the "Redbird."

Laysan is the metropolis of the Laysan

Albatross, a beautiful bird as large as a goose, with snowy breast, black wings, and delicately tinted bill. With it is found the Sooty Albatross, the "Gooney," familiar to tourists on trans-Pacific steamers, of equal size, but with sober sooty-gray plumage.

MARAUDERS DECIMATE LAYSAN

For a part of each year these Albatrosses frequent the high seas, true seafarers, who see no land even during periods of storm. About the first of November they resort to remote, uninhabited islands where they gather in colonies, as have their ancestors for thousands of generations, for the purpose of rearing young.

On Laysan their return each year was an event in the life of the guano workers, heralded with as much excitement as the arrival of some famous traveler in settled communities.

Early visitors who came to Laysan, with considerable exaggeration, placed the numbers of Albatross in the millions; actually they ran to many thousands. Mated pairs of the Laysan species dotted the whole inner basin except where bushes prevented their nesting, while the Sooty Albatross colonized the barren sand beaches.

Unmolested for centuries on land, the birds of Laysan knew their only enemies in the sea, so that man on his arrival was accepted as a phenomenon of interest, to be treated without fear. Aside from a certain amount of egging, and the pulling of the long, ornamental, central tail spikes of the Red-tailed Tropic Birds, the guano workers troubled the birds little except for the necessary infringement on their breeding areas.

When, in 1909, the entire Leeward chain, with the exception of Midway (which is under the jurisdiction of the Navy Department), was set aside as the Hawaiian Bird Reservation, it seemed that this action would provide final protection for the harmless, friendly hordes of sea birds that nested there. But other forces were at work. Fashion still demanded feathers for feminine adornment, and this trade, blocked for the time within the limits of the United States, turned to more distant fields.

Word came somehow to Honolulu that poachers were at work to the westward, and in January, 1910, the revenue cutter *Thetis*, under Captain W. V. E. Jacobs, surprised and apprehended 23 Japanese on Laysan and near-by Lisiansky, engaged in killing the birds. One lot of plumes is supposed to have been shipped before the arrival of the *Thetis*, yet the wings and other feathers of more than a quarter of a million birds were still stored in the old buildings on Laysan.

The vast rookeries had been systematically decimated by men armed with clubs. Hand cars and the old rail line left by the guano workers had been utilized to bring the spoils to camp for preparation and treatment, and, as usual in plume-hunting operations, the ground round about displayed the sad accompaniments of decaying carcasses and dead or starving young, among which wandered a few bewildered or crippled birds.

Prompt action had, however, saved part of the bird colonies, and, free from further attack, the Albatross and Tern were left to regain something of their former numbers.

THE RABBIT MADE LAYSAN A DESERT ISLE

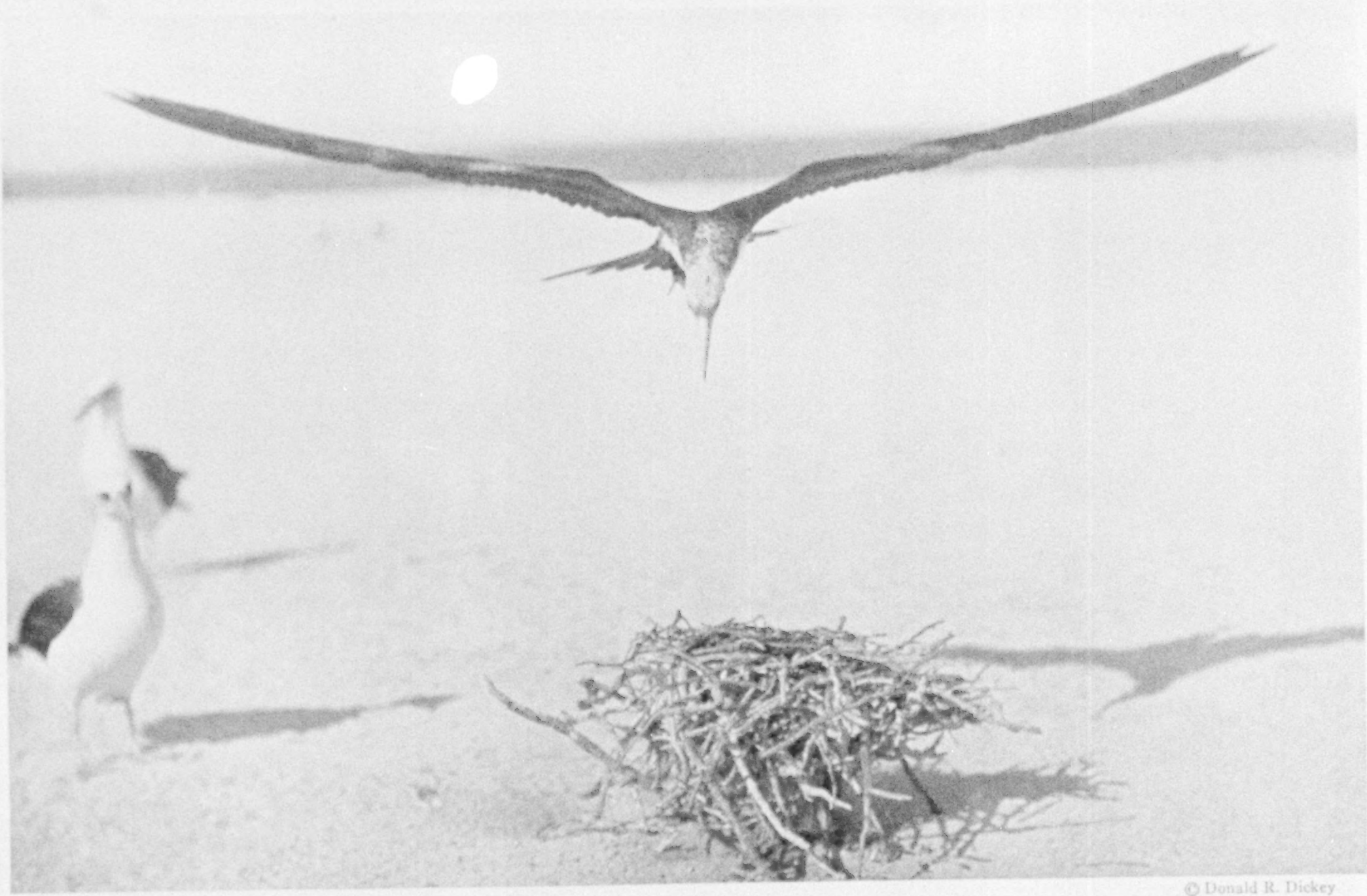
With danger from plume hunters eliminated, one might suppose that the bird colonies on this distant bit of American soil would flourish as in ages past, but further tribulation was in store. Disturbances to the supersensitive adjustment of Nature's forces through the coming or the temporary presence of civilized man are often strange and unexpected in their appearance and cumulative effects. As an instance, on Laysan tremendous damage has been wrought through the agency of the domestic rabbit, an animal that we might consider one of the most inoffensive of man's friends.

Some time in 1902 the foreman of the guano works brought to Laysan three or four pairs of rabbits, partly to amuse his children, and partly for the fresh meat that they would furnish. For a time the animals were kept about the houses, but gradually a pair or two wandered away, attracted by broad tracts of grass, succulent herbage, and protecting shrubs. Rabbit enemies there were none, as cats and dogs were forbidden because of their damage to birds.

© Donald R. Dickey

THE SPIRIT OF LIGHT

The quiet curiosity of the Love Tern is in striking contrast to the screaming threat of other Terns. One of the sailors of the *Tanager* actually had one of these gentle birds alight on his outstretched, motionless hand. This incident is evidence of that rare bird comradeship which remains to the author as his most intimate memory of Laysan Island.



© Donald R. Dickey

POISED FOR THEFT

This air pirate (see, also, page 89) hovers on incomparable wings before swooping down to snatch a nest stick from neighbors of its clan, even as it snatches daily food, by threat or violence, from the unwilling Booby and Shearwater. In recent years the destructive rabbit has made nesting material a supreme desideratum of the Frigate Birds of Laysan Island.

XUM

© Donald R. Dickey

THE FRIGATE BIRD OF THE SAILOR

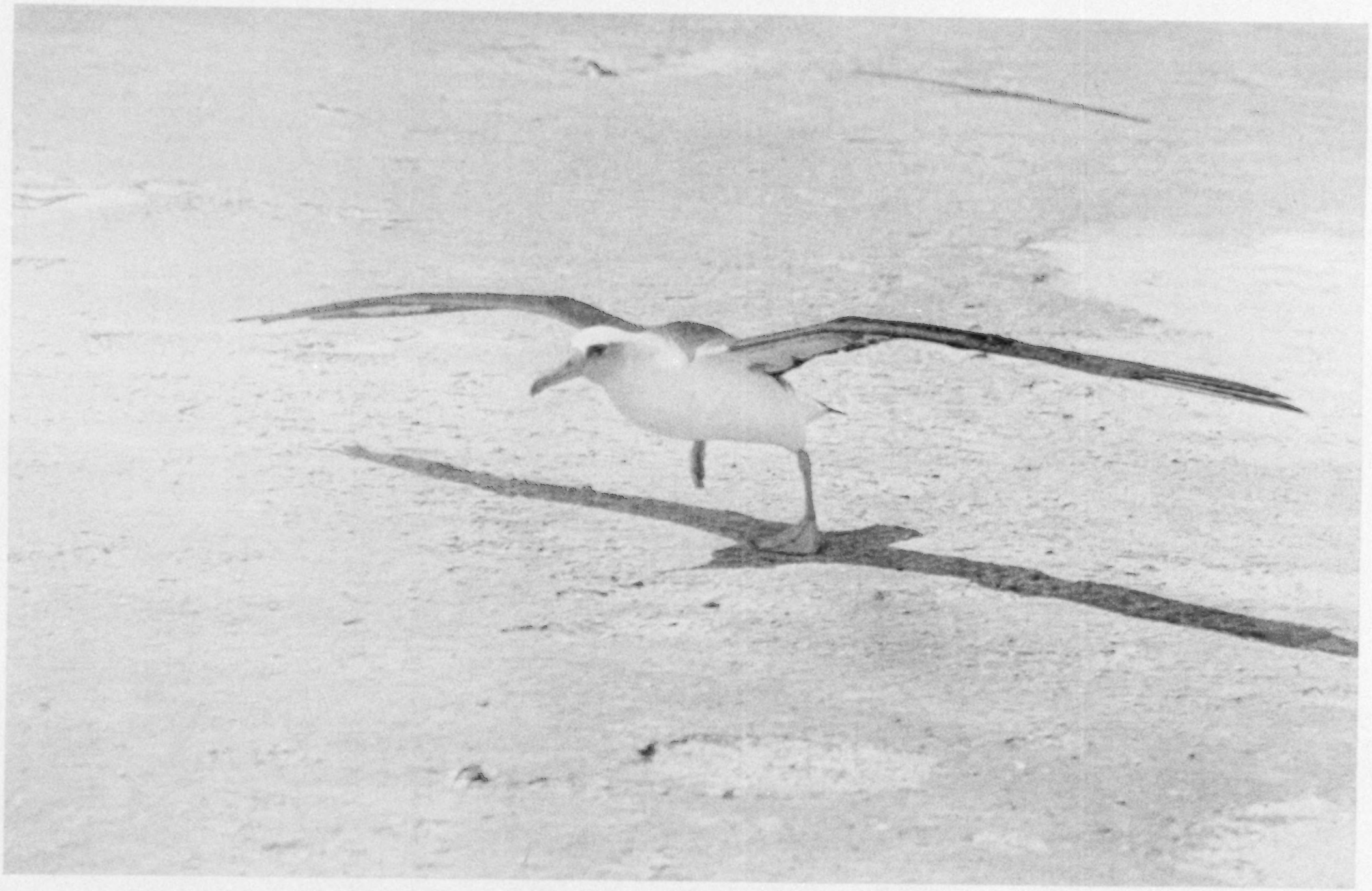
The female of *Fregata* retains a proper white and feathered throat throughout the year, but during the mating season the male develops a highly inflatable gular sack of flame-red, naked skin. With this weird and colorful throat pouch he wigwags his comic invitation from a chosen nesting site to the females soaring overhead. Then, as a lady yields and builds the nest he has visioned on the chosen site, this strangely decorative and otherwise useless toy balloon shrinks quickly to the texture and insignificance of a turkey's wattle, and the male Frigate Bird loses, for the season, one of the strangest of secondary sex adornments.

© Donald R. Dickey

GETTING UP SPEED

The Laysan Albatross gets under way with effort—with strenuous taxiing, with kicking legs, and scattered sands (see, also, page 91).

MUSEUM



© Donald R. Dickey

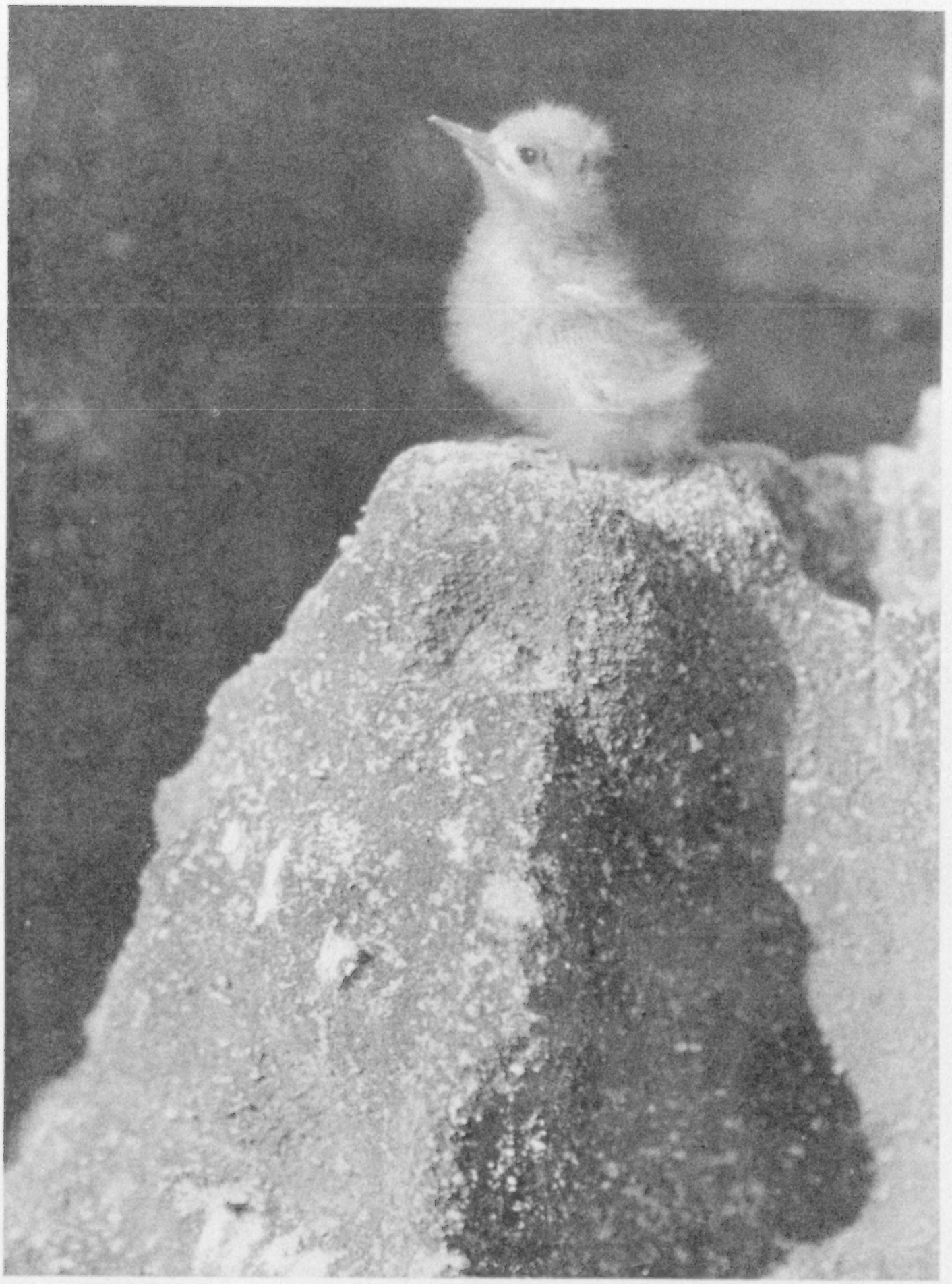
READY TO "TAKE OFF"

If any bird has an important aviation lesson to teach us, it is the Albatross, for its soaring grace intrigued the thoughts of man long before he dreamed of human flight. After centuries, it remains, perhaps, the best example of specialized adjustment to the complex of air current, mass, and gravity (see, also, pages 90, 96, and 102).

© Donald R. Dickey

THE RED-FOOTED BOOBY LOOKS OUT UPON THE WORLD FROM A SHOE-BUTTON EYE

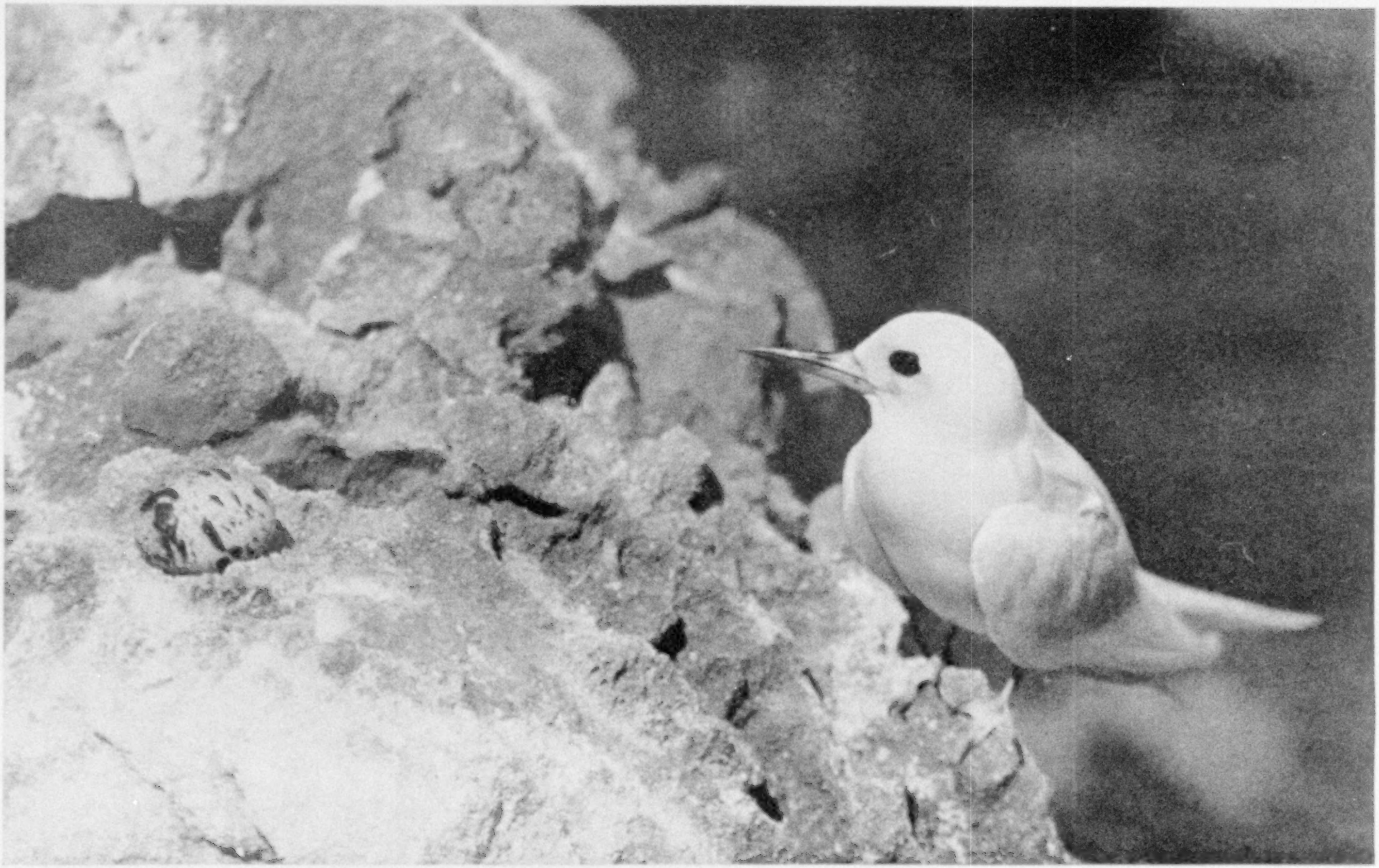
This is one of the three species of Booby found by the *Tanager* Expedition on Laysan Island (see, also, illustration, page 100, and text, page 103).



Photograph by Donald R. Dickey

A YOUNG LOVE TERN SITS IN MEDITATION: LAYSAN ISLAND

This species clings as tenaciously to precipitous limestone walls as did its ancestors to nestless, horizontal limbs (see, also, illustrations on pages 87 and 94).



Photograph by Donald R. Dickey

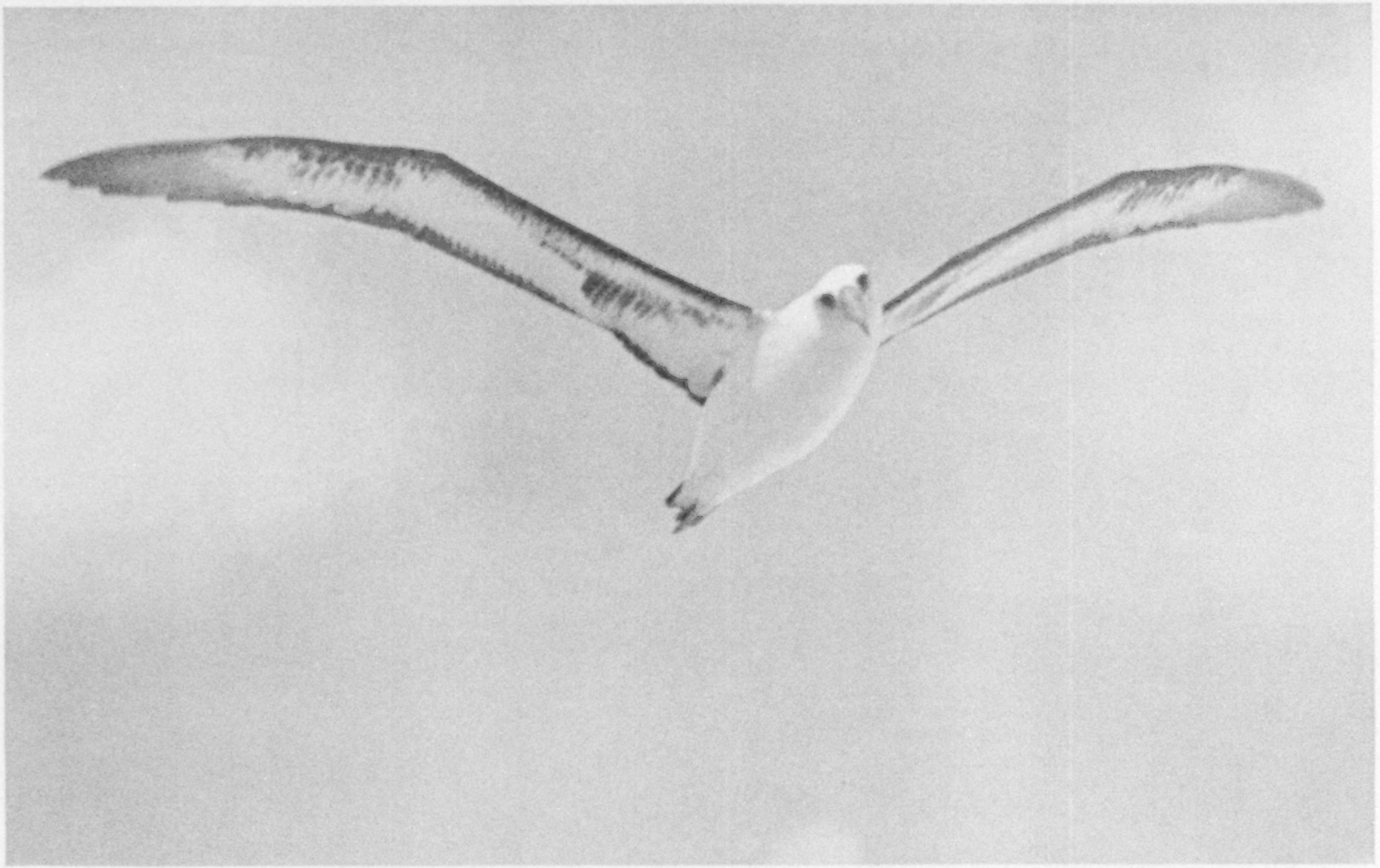
THE LOVE TERN'S NEST

This gentle sea bird was wont, in the good old days of sturdy vegetation on Laysan Island, to balance its annual egg, nestless, upon a precarious horizontal limb—a strange arboreal habit for a Tern, doubtless originated by the species out of bitter experience with land crabs or some other enemy in its more southern metropolis. When the man-curse of the rabbits eradicated the bushes from Laysan, the Love Tern quickly adapted itself to the sudden ecologic change, and now lays its egg on the precipitous pinnacles and shelves of a rock ledge at the southern end of the island.

© Donald R. Dickey

A COLONY OF WEDGE-TAILED SHEARWATERS ON THE SANDS OF A SHELTERED COVE OF LAYSAN ISLAND

The scene typifies the calm spirit of an atoll in the Pacific. Despite the man-wrought change caused by the introduction of rabbits, in the spring sea birds still come to Laysan in countless thousands to nest (see text, page 86).



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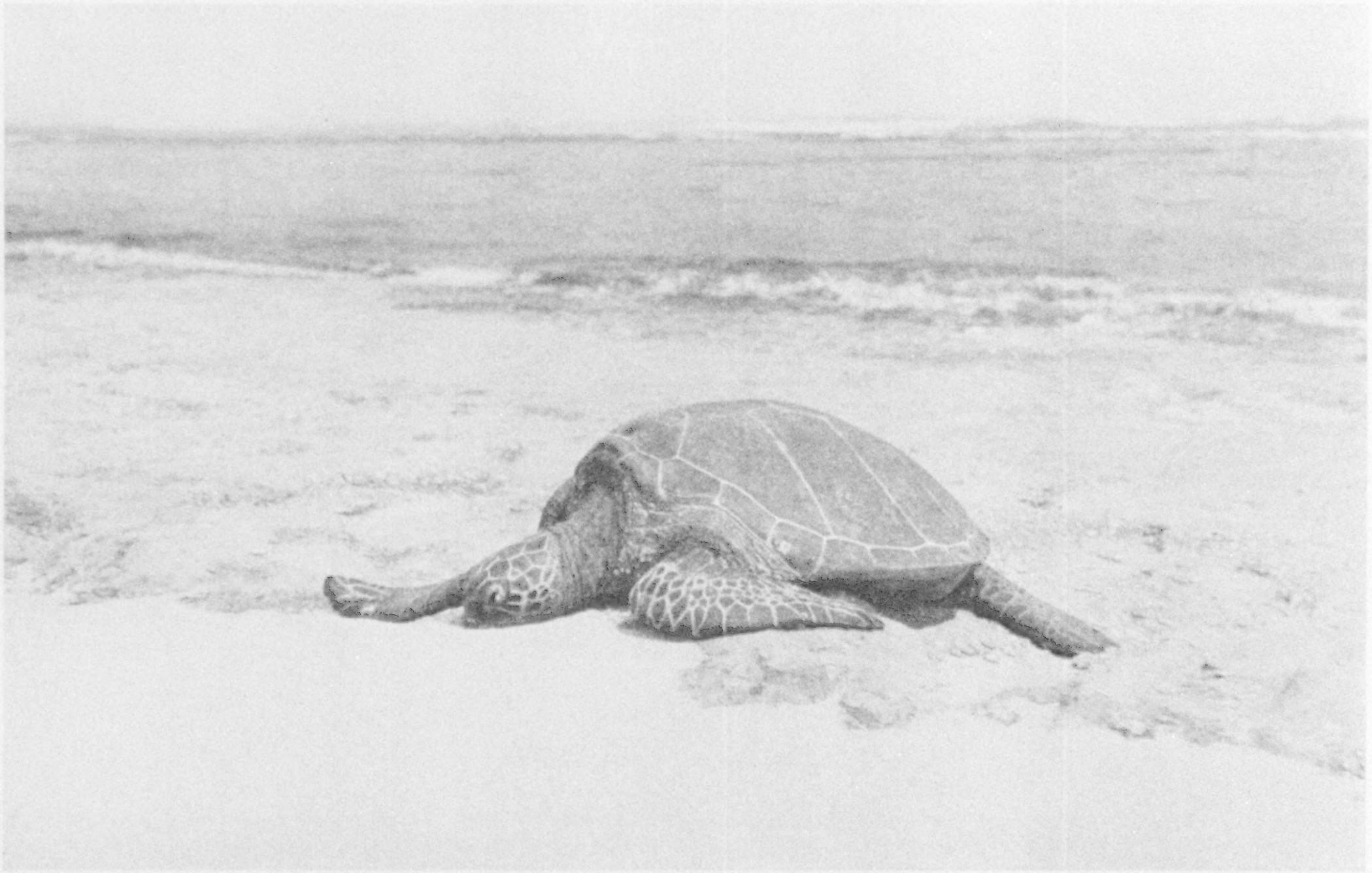
A BIRD'S-EYE VIEW

Unlike the bird of Coleridge's lay, which "came to the mariner's hollo," the *Tanager* Expedition found the Laysan Albatross strangely shy of ships at sea. Once on land, however, these same birds accepted members of the party as peers, eyed them merely in curiosity, pried at the shiny tripod screws, investigated sleeve buttons, and actually cakewalked up to nibble gently at the author's fingers with bills that could easily have ripped an artery! Is not this familiarity on land but simple proof that these sea birds have never had a land enemy? At sea, sharks and other foes have doubtless harried them, but on land, on their nesting grounds, no single enemy has arisen to teach them sophistication. The tribal history of the Hawaiians bears out this obvious theory, for no record of these farther outlying islands antedates their discovery by historic navigators. No other potential bird enemies exist on these islands, where sea birds have doubtless nested for thousands of generations. What more natural than that they should to-day greet an itinerant naturalist merely as a curious, overgrown peer?



Photograph by Alexander Wetmore

A GREEN TURTLE ASLEEP ON A SANDY BEACH: LISIANSKY ISLAND

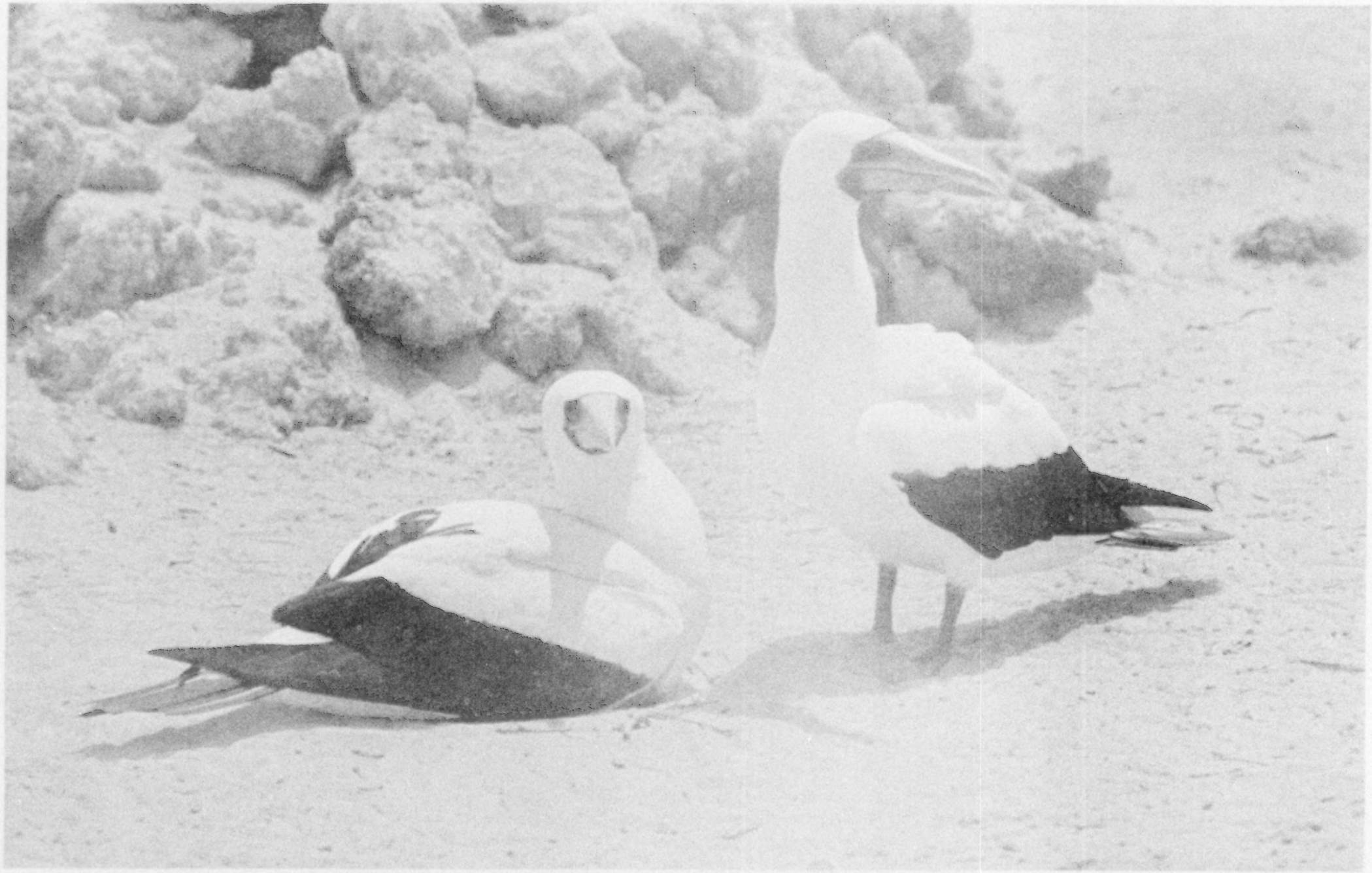
These grotesque creatures browse in submarine fields of algæ until hunger is satisfied, and then crawl heavily out to sprawl in the sand, safe from enemies in the sea. On one occasion, the author, while walking 300 yards along the beach on Lisiansky Island, counted 80 of these creatures from fifteen inches to four feet in length. Others, feeding a few yards offshore, were hidden by ripples on the water and so escaped this casual census. Their only enemies seem to be sharks.

© Donald R. Dickey

THE RED-TAILED TROPIC BIRD

Seen against a Laysan sky, with plumage of snowy white, and bill and strangely specialized median tail quills of flaming red, this bird is a never-to-be forgotten picture of color and of life on Laysan Island.

XUM



© Donald R. Dickey

THE BLUE-FACED BOOBY OF LAYSAN CONTENTS ITSELF WITH A GUARDED HOLLOW IN THE SAND, IN WHICH TO INCUBATE TWO CHALKY EGGS

According to Dr. Loye Miller, one of our few authorities on avian paleontology, the strange factor of evolution which sealed up the nostrils of the Booby was operative at least as early as the Miocene Period. This trick of Nature saddled these birds with a bill expression which remains comic to this day.

Photograph by Donald R. Dickey

THE ONE REMAINING TENEMENT OF LAYSAN ISLAND

This ironwood has resisted the tooth of the devastating rabbit (see page 103) and the blast of consequent sand storms, until to-day Red-footed Boobies and Hawaiian Terns crowd in upon it as the only nesting site on the island reminiscent of their ancestral home.

XUM

Photograph by Donald R. Dickey

SOOTY-BACKED TERNS FACING THE NORTHEAST TRADES

About the central lagoon of Laysan Island a growth of fleshy Sesuvium still persists, despite the rabbits. On this cool carpet colonies of the Laysan Albatross (see pages 90, 91, and 96) and of this Tern congregate to nest.

© Donald R. Dickey

ALOFT IN A STIFF TRADE BREEZE

Once a-wing, the Albatross attains the ideal of banking and of soaring flight (see, also, pages 90, 91, and 96).

Albatross must have gazed with tolerant curiosity at these lop-eared invaders, with their curious hobbling gait, while no doubt many an irate Shearwater hustled them with much strong language (if tone of voice is any criterion the Wedge-tailed Shearwater is a master of profanity!) from the shelter of his nesting burrow.

With abundant food and a genial climate, bunny's increase was incredibly rapid.

NATURE'S BALANCE UPSET, DISASTER FOLLOWS

Early accounts of Laysan Island and photographs taken 20 years ago depicted it as a pleasant spot covered with green vegetation. Reports of damage to shrubbery had led us to expect some changes, but had not prepared us for the utter desolation that greeted Commander King and me when we landed in the little harbor and walked slowly up the sandy slopes to a point near the tumbledown buildings remaining from the guano workings.

On every hand extended a barren waste of sand. Two coconut palms, a stunted hau tree and an ironwood or two, planted by former inhabitants, were the only bits of green that greeted the eye. Other vegetation had vanished. The desolateness of the scene was so depressing that unconsciously we talked in undertones. From all appearances, Laysan might have been some desert, with the gleaming lake below merely a mirage.

Without the restraining influence of active enemies, rabbits had multiplied until they had absolutely stripped the island and then had slowly starved. Of the vast army of destroyers only a few hundred remained.

We had come prepared to eliminate the rabbits, so, with camp established, the work began at once. The destruction of the majority was simple, but the survivors became wary and it was necessary to hunt them out one at a time.

Perhaps the procedure appears heartless, but it was one of necessity. Left unchecked, the creatures might have eked out a precarious existence for a few years longer, but starvation was the inevitable fate in store for them, coupled with unending hardship for the multitude of other creatures associated with them. Furthermore, so long as rabbits remained on Laysan there was danger of their transportation elsewhere, with resultant injury to other pleasant spots.

Pursuit, therefore, was relentless and effective. A party sent to Laysan a year after our visit reported no sign of a single survivor.

In spite of the rabbits, a few dozen Laysan Finches still sang their sprightly songs about the buildings or hopped among the rocks near the lagoon. Three individuals alone of the little Honey Eater remained on our arrival; these perished during a three-day gale that enveloped everything in a cloud of swirling sand. The Millerbird had disappeared entirely, and of the Laysan Rail but two remained. The duck (properly called the Laysan Teal), never numerous in recent years, as it was killed for food, had about held its own, 20 individuals being present — a scant foothold on existence for its species.

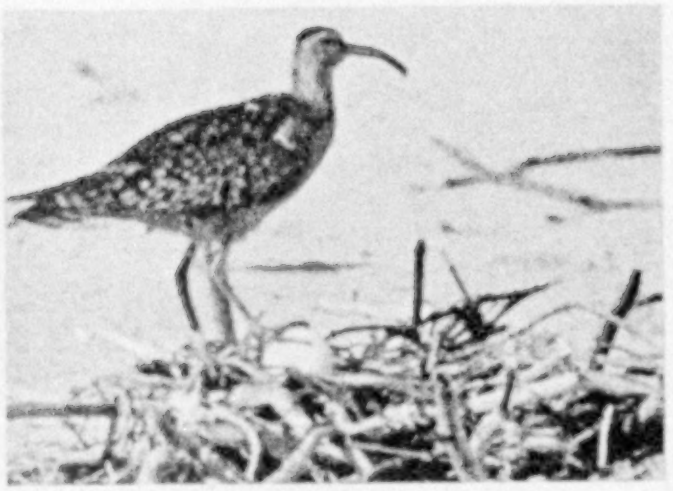
The Albatross, though reduced in numbers, were still present by thousands, and with them were many Boobies, Frigate Birds, and hosts of Shearwaters and Terns. The White-breasted and Tristram's Petrels, small species that appear mainly at night, were the only sea birds that seem to have suffered. They had almost disappeared; drifting sand, no longer restrained by vegetation, had buried them alive in their earthen burrows dug for hiding places against the light of day, or to conceal their nests.

Let us hope for happier days when, with vegetation renewed, these birds may repopulate their former territory from colonies on near-by islands.

LAYSAN RABBITS DEVASTATE LISIANSKY

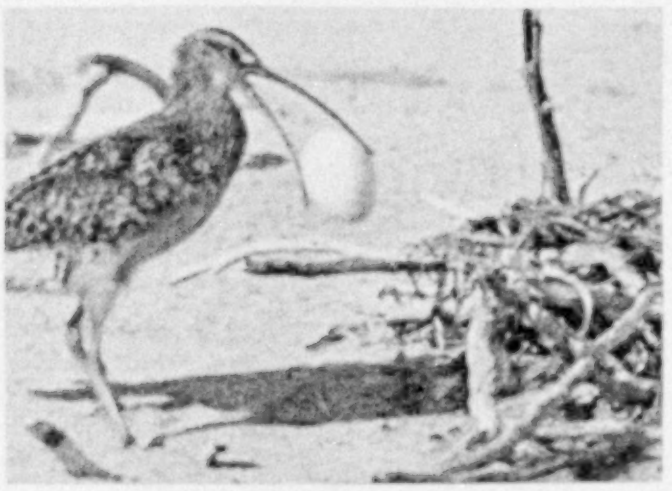
The island of Lisiansky, 120 miles west of Laysan, was named in 1806 by the Russian explorer, Urey Lisiansky, while en route from Sitka to Canton. For two or three days his seamen had noted flying birds and other signs of land and one evening, without warning, his ship grounded on a coral reef.

After two days' severe labor it was salvaged and Lisiansky went ashore on the island within the reef. He described it as covered with creepers and other vegetation, but a desolate place, whose soil was undermined by the burrows of



A BRISTLE-THIGHED CURLEW

This bird navigates nearly 3,000 miles of open sea from its Arctic nesting grounds to its winter resort in Polynesia.



Photographs by Donald R. Dickey

A BEAKFUL

The author found these Curlews consistently robbing the birds which nest on Laysan Island. No shore birds save those which visit Polynesia have ever been convicted of cannibalism.

a dovelike bird, with a mournful, moaning note (the Wedge-tailed Shearwater).

We sighted Lisiansky through an early morning haze, but came in slowly over uncertain shoals to an anchorage, so that it was afternoon before we landed.

The island is a parallelogram a nautical mile long by slightly less than a mile wide. A low ridge 40 feet high on the northeast marks the highest point, while the central portion forms a low basin bounded by a rim that protects it from the ocean. In an early stage this basin was in all probability a lagoon like that at Laysan.

Never have I seen a more desolate spot. Rabbits, brought from Laysan by misguided persons who thought to leave a food supply for possible castaways from shipwreck, had completely stripped the island of its vegetation and then had died of starvation. Their bleached and weathered bones strewed the sands.

A few roots of grass and of pigweed had grown sufficiently deep to escape the incessant search of the starving four-legged pests and, with the final disappearance of the mammals, had begun a battle against the forces of wind and sand to recover the island.

Insect life had also practically disappeared, and land shells, abundant on most of these islands, were extinct. A species of rat had been reported as plentiful here, but it had also vanished and no specimens of it have been preserved for science.

A view of the life of the surrounding sea offered a welcome contrast to the dismal aspect of the land. We were struck in particular by the large number of sea turtles. Shallow coves along the beaches were filled with luxuriant growths of algæ, submerged fields of green kept in constant motion by passing waves. Amid these plants browsed dozens of turtles, at intervals thrusting their heads up for air, and then submerging to continue their feeding. When satisfied they crawled clumsily out on the sloping sands to lie in peaceful sleep (see page 97).

CABLE COMPANY TRIES TO BEAUTIFY LONELY ISLAND ROCK

Rough and stormy weather marked our stop at Pearl and Hermes Reef, where we found several low sand islands scattered over a broad lagoon. Colonies of the rare Hawaiian monk seal and many other creatures of interest were found here, and it was with regret that we terminated our brief stay and continued our journey.

The atoll known as the Midway Islands, usually abbreviated to "Midway" (see page 86), is now under lease to a cable company which here operates a relay station on the line between Guam and Honolulu.

Here reside 12 to 15 whites and an equal number of Orientals, who act as servants, in touch with the world only through the long undersea line that reaches both east and west. At intervals of three months a supply boat brings mail and stores from Honolulu.

At the time of our first visit we were received with delight, as the cable boat

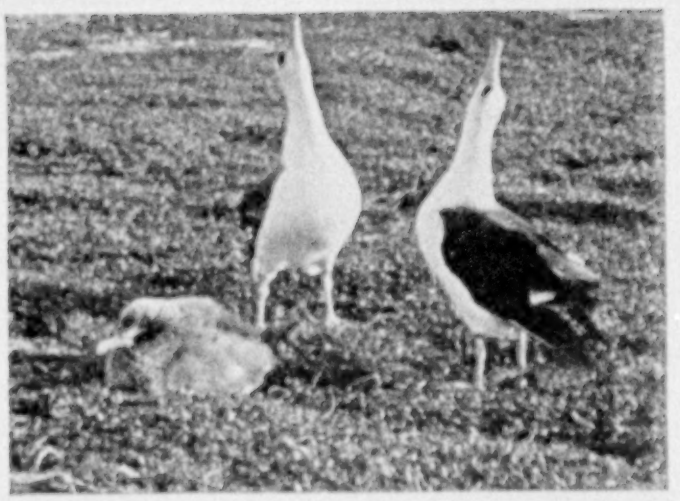
"MAY I HAVE THIS DANCE?"

"DELIGHTED, I'M SURE!"

AFFECTIONATE RUBBING OF NOSES IN TRUE POLYNESIAN FASHION

"EXCUSE ME, PLEASE, WHILE I FIX MY SHOULDER STRAP"

THE DANCE HAS INFINITE VARIETY, BUT

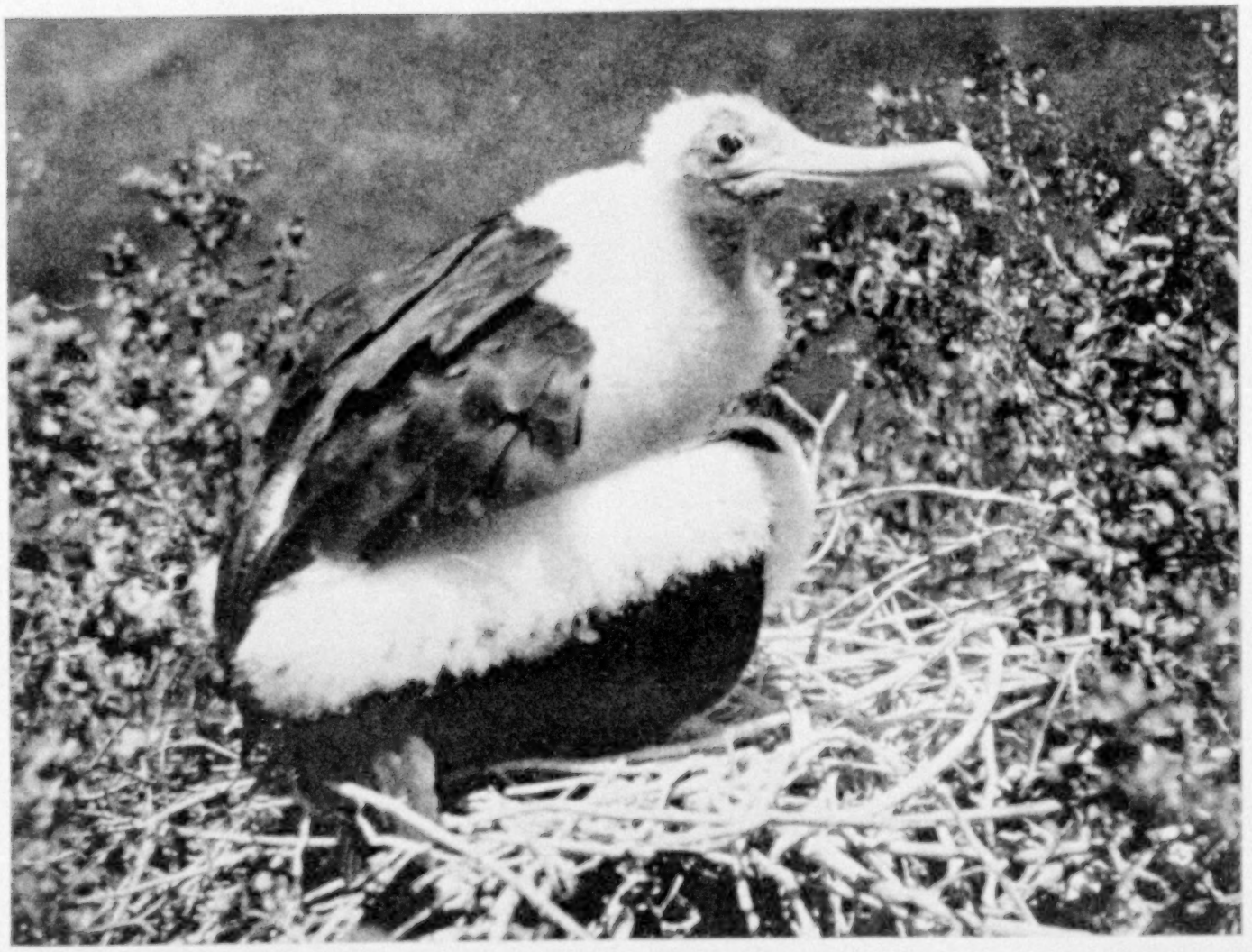


IT INVARIABLY ENDS IN GROANING EXALTATION

Photographs by Donald R. Dickey

PORTIONS OF THE FIRST MOTION PICTURE EVER MADE OF THE WEIRD DANCE OF THE LAYSAN ALBATROSS

This dance doubtless originated as a corollary of courtship, but to-day it seems to have lost practically all sex significance. All through their stay on the island the birds dance, apparently for exercise or for the sheer joy of the fantastic measures. Throughout the colony, bird after bird seeks out a willing partner and takes up the dance in screaming exuberance.



Photograph by Alexander Wetmore

A YOUNG FRIGATE BIRD (SEE, ALSO, PAGES 88 AND 89): LAYSAN ISLAND

The great wings, that in a few weeks will bear it gracefully in the air, now hang below the breast.

had been out of commission and we brought the first mail that had been received in four and a half months.

The lagoon at this atoll contains two main islands, Sand, on which is located the cable station, and Eastern, a mile or more distant. Each is perhaps a mile long and rises well above the reach of the highest seas.

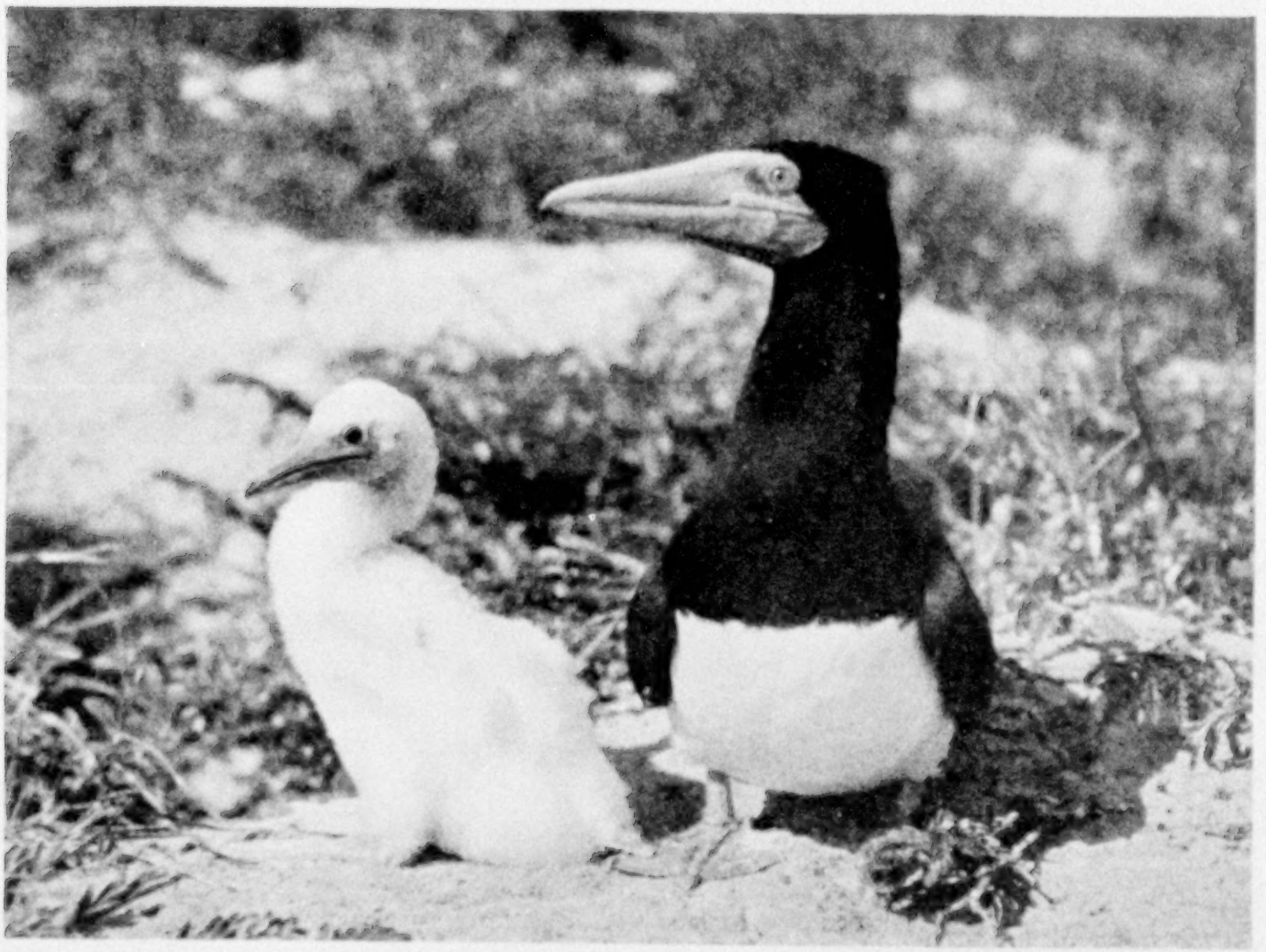
The cable company has worked steadily to improve conditions on what originally was a desolate spot of glaring sand and scattered bushes. The main buildings, four in number, are of steel and concrete, arranged at the corners of a little plaza. Earth, brought in sacks from Honolulu, covers the barren sand near the buildings and nourishes pleasant lawns, clumps of ornamental shrubs and flowers.

The whole is surrounded by a heavy protective windbreak of ironwood, or casuarina, trees between whose trunks one may catch glimpses of the clear green waters of the lagoon. Tree-lined walks lead to the wharf and to a garden, where vegetables thrive, with abundant weeds imported with the garden earth.

A few sheep and a cow or two, high windmills in the background, and the introduced vegetation give a suggestion of some Argentine *estancia*, an illusion that is dispelled by a few minutes' walk that takes one to the bleak, wind-swept sands outside this artificial paradise.

As a unique feature of its bird life, Sand Island has a thriving colony of domestic Canaries which live at freedom in the shrubbery. In the mild and pleasant climate they have increased from a few pairs to several hundred individuals.

The Laysan Finch and the little Flightless Rail have also been naturalized here and on Eastern Island. A morning awakening in a comfortable room at the cable station, with a cheerful chorus of song from Canaries and Finches, offered a



Photograph by Alexander Wetmore

PROUD BOOBY AND CHICK

pleasant contrast to the matutinal salutation of a multitude of Shearwaters, heard through the canvas walls of a tent whipping in the steady trade winds, that was our portion elsewhere.

SHIP'S GIG TRAVELS 1,300 MILES FOR HELP

Though barely over the horizon from Midway, Ocean Island, the most northwestern point in the Leeward chain, is seen more seldom than any of the other atolls or islands in the entire Hawaiian group. On older maps other islands, marked as Patrocinio, Morrell, or Byer, are shown farther to the west, but modern surveys have failed to establish their existence.

Ocean Island consists of an irregular circle of coral four miles or so in diameter, with a semicircular fragment, known as Green Island, 1,800 yards long by 300 yards wide, at its eastern side.

Green Island, only 25 feet above the sea at its highest point, is so low that the atoll is a considerable menace to navigation in these waters. The surrounding reef has brought destruction to a number of ships.

Perhaps the most celebrated shipwreck at Ocean was that of the U. S. S. *Saginaw*, under Lieut.-Commander Montgomery Sicard, engaged in 1870 in deepening the channel into the lagoon at Midway. On completion of this work the *Saginaw* proceeded to Ocean Island, to verify its position, and to examine it for possible shipwrecked sailors.

A course was laid to bring them to this island at daybreak, but at three in the morning, with only brief warning, the *Saginaw* ran on the reef, and by dawn had been pounded in two by the surf.

The ship had struck near Green Island, the crew remained from the end of October, 1870, until January, 1871, living in part on the scanty stores saved from the ship, but mainly dependent on seals and sea birds.

Five men in the ship's gig made the perilous journey to Hanalei, Kauai, where they were wrecked in the surf as they at-

Photograph by Alexander Wetmore

THE CAMP OF THE AUTHOR'S SCIENTIFIC PARTY ON JOHNSTON ISLAND

tempted to land, and four of their number drowned; the survivor, William Halford, brought news of the plight of the *Saginaw* and a ship was dispatched from Honolulu to rescue her crew. The ship's gig, which made the perilous journey of more than 1,300 miles for aid, may be seen in the Naval Museum at Annapolis.

THE FIRST NATURALISTS TO VISIT OCEAN ISLAND

So far as I know, Green Island had not been visited previously by naturalists, so that our explorations were made with keen anticipation.

A shelving beach of coral and shell sand, 50 to 80 feet wide, extends entirely around the island. Inland we found series of low sand dunes grown with a peculiar shrub, sometimes known as beach magnolia (*Scævola lobelia*). In the center of the island, sheltered by the dunes, were irregular openings grown with grass and creepers.

Ocean Island, like Pearl and Hermes Reef, is a stronghold of the Hawaiian monk seal that hauls and breeds unmolested on the beaches. Albatross are common, and we found the open inland meadows honeycombed with myriad Petrel and Shearwater burrows, so that every few steps we fell in to our knees through the roofs of these hidden pitfalls.

The inner meadows are death traps for many Laysan Albatross that drop in here casually, deceived by the apparent security and protection from wind. A few seem able to rise on the wing without difficulty; others in running to gain the momentum necessary for flight (see pages 90 and 91) trip on long vines and creepers and fall headlong. Discouraged by successive occurrences of this sort, they walk about until weakened and finally die of starvation.

Among other creatures, we found here multitudes of rats, about one-fourth the size of our gray rat and related to the native Hawaiian rat, now extinct except for a little colony on Popoia Island, off the north shore of Oahu.

These rats on Ocean Island, long-tailed, brown-haired, heedless creatures, appeared at dusk in swarms, so that by morning the sand was laced with their tracks. They belong to a group whose forms are widely scattered in the Pacific, and may have been distributed from island to island as stowaways in the great sailing canoes of the Polynesians. Their spread by this means is as logical as the known spread of the gray rat by means of the sailing ships of the Caucasians.

FOR THOSE DIFFICULT MEALS ~ THE SUMMER LUNCHEON AND SUPPER !

Of course Campbell's Vegetable is a soup—a hearty and delicious soup. Yet the fact that it is served so frequently as the principal dish of the meal—in many cases practically the only dish—shows that people think of it as more than a soup.

In this one dish—Campbell's Vegetable Soup—are delicious vegetables, invigorating beef broth, substantial cereals, fresh herbs and tempting seasoning. Thirty-two different ingredients.

The summer luncheon and supper are so apt to prove real problems. Yet planning and providing are both made simple when you select Campbell's Vegetable Soup. And it is so satisfying!

12 cents a can

LOOK FOR THE RED-AND-WHITE LABEL

Who owns the telephone?

For seven carefree years young John Graves worked in the car shops at Orenville, spending his dollars as fast as he earned them. Soon after his promotion to foreman, he was married and moved to a little white house on Orchard Avenue. Life was happier than ever, but spare dollars were not more plentiful, especially after a third member was added to the family.

Then came a day when the plant superintendent showed John the wisdom of saving a part of his earnings, for the satisfaction it would bring, and for protection against emergencies and old age. He and his young wife, for the first time, learned the difficult art of economy, and finally they came to know the joys of saving and of safe investment.

Today John Graves, and many thousands like him, own the stock of the American Telephone and Telegraph Company. This company is owned by more people than any other, and the great majority of its owners —laborers, clerks, housewives, business men and others—have bought it with their savings. As its business has grown, the number of its shareholders has increased until now one out of every 45 telephone subscribers is also a stockholder.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

BELL SYSTEM

One Policy, One System, Universal Service

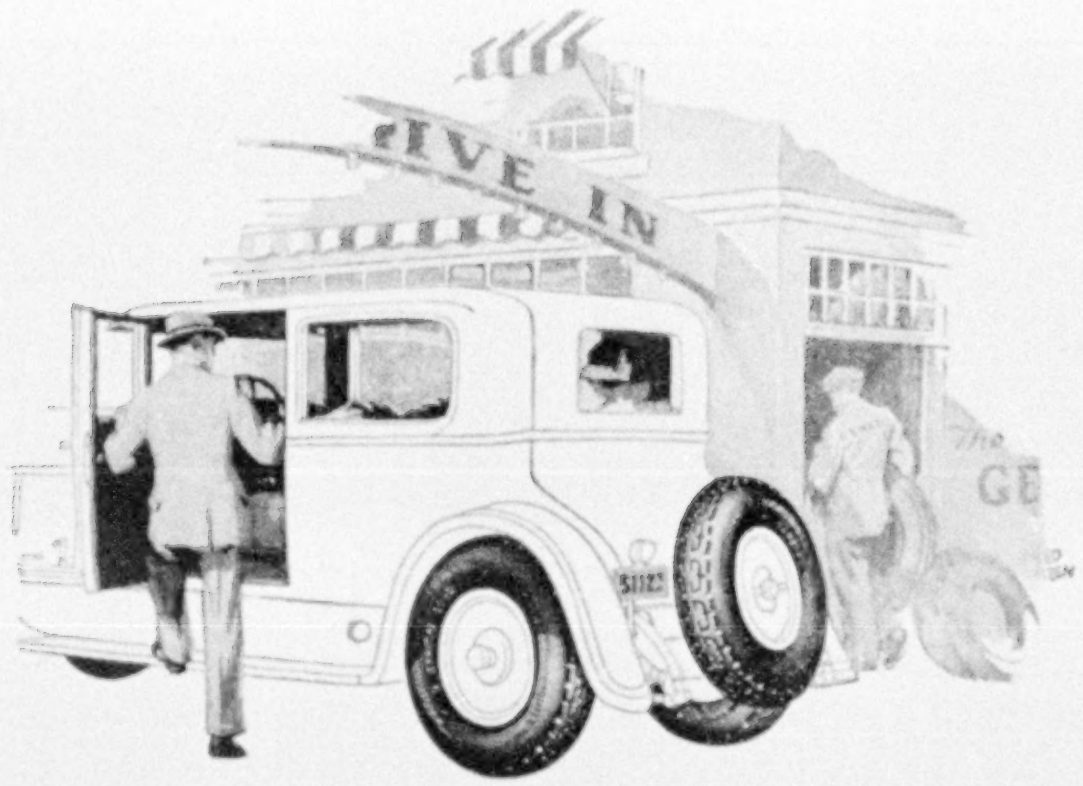
Kodak as you go

The most precious mementos of any trip are the Kodak pictures you make. Again and again you'll turn to them with ever-increasing pleasure.

All Kodaks are Autographic. You can date and title each exposure as you make it—an exclusive, Eastman feature.

Autographic Kodaks $6.50 up

Eastman Kodak Company, Rochester, N.Y., *The Kodak City*



A General Cord often serves two owners

After delivering satisfactory mileage to the original purchaser it is not uncommon to see a General Cord go to work for its second owner.

General's outstanding record of big mileage has led many car owners to actually prefer buying used Generals rather than new tires of the cheaper makes. They find that even a worn General "goes a long way to make friends."

The Mark of Leading Tire Stores Everywhere

The General distributor gets his supply of these partly worn Generals by making allowances on them when he puts new Generals on the cars of his customers. Surprisingly many trade in their tires regularly each year.

Resale value after 10,000 miles

The

GENERAL

CORD

—goes a long way to make friends

BUILT IN AKRON, OHIO, BY THE GENERAL TIRE AND RUBBER COMPANY

Chrysler Six Sweeps On To Higher Sales Records

Mounting sales figures show that the Chrysler Six—already a record-breaker in popularity—is soaring higher than ever before.

The latest weekly report registers an increase of 116% in retail sales over the corresponding week of 1924; and the sales for that week were 65% bigger than the very biggest week of 1924.

Furthermore, the last three weeks reported are the biggest weeks of 1925.

The public knows that no matter what the make or price, only the Chrysler Six gives them Chrysler results.

For this car has proved its great strength, stamina, and stand-up-ability, with a motor which has no period of vibration, with an economy of safely over 20 miles to the gallon of fuel, an oil consumption equally low, and a high-gear speed range of from 2 to 70 miles an hour.

Longer life is assured not only by fine materials and careful workmanship, but also by the oil-filter which cleanses all motor oil as the car runs, and by the air-cleaner which keeps out 80% of the road dust which ordinarily enters a motor.

Of moderate weight, the Chrysler Six rides as easily as a two-ton car—and it rides the ruts with comfort even at high speed—due to its scientific spring suspension, and to its stabilators.

If you are not yet familiar with this new kind of car, the Chrysler Six dealer is eager to give you any kind of a demonstration you desire.

Touring Car, Phaeton, Coach, Roadster, Sedan, Royal Coupe, Brougham, Imperial and Crown-Imperial—attractively priced from $1395 to $2195, f. o. b. Detroit subject to current government tax. Bodies by Fisher on all Chrysler Six enclosed models. All models equipped with special design high-speed balloon tires.

There are Chrysler dealers and superior Chrysler service everywhere. All dealers are in position to extend the convenience of time-payments. Ask about Chrysler's attractive plan.

CHRYSLER MOTOR CORPORATION, DETROIT, MICHIGAN
MAXWELL-CHRYSLER MOTOR COMPANY OF CANADA, LIMITED, WINDSOR, ONT.

CHRYSLER SIX

Look At Their Faces— Then Look At Their Shoes

SHOES often will write a story in a woman's face that is misread as a sign of age . . . little lines of pain about the eyes, frown lines on the forehead and lines of fatigue drooping down from the mouth.

"Feet wrinkles," Prudence Penny calls them. She says that callouses and lack of stamina are not the only penalties of improper footwear. In an article on how wrongly shaped shoes will bring wrinkles to the face, she says:

"Yes, I know these wrinkles manifest themselves a long distance from their source, but a few lessons in teaching a young girl how to take care of her feet and purchase shoes that fit properly, how to hold the arch in its place and yet give freedom and air to the feet and ankles, will prevent many of these 'feet wrinkles' as time passes. The mature woman can also help and probably eliminate them by first fitting her foot, and then giving a few minutes daily to building up the tissues and massaging out the lines in the face."

Miss Penny and many other writers on health and beauty subjects recommend a shoe that is flexible from toe to heel, made along the natural lines of the foot, a shoe with room for the toes and with heels of moderate height. Mrs. Oliver Harriman, Anna Pavlowa, Ethel Barrymore, Neysa McMein and many other women in all walks of life also had these points in mind when they endorsed Cantilevers. If you like thorough foot comfort, combined with trim style, you, too, will probably find the Cantilever a helpful, satisfactory shoe.

A flexible shoe for your flexible foot

The Cantilever Shoe permits the foot muscles to exercise and gives you a wonderful feeling of foot freedom. It is flexible from its trimly rounded toe to its closely fitted heel.

There is no restriction of foot muscles. The flexible shank functions with the foot. Every step you take exercises the foot and builds up its springy strength.

The scientifically designed Cantilever heel swings the body weight off the inner and weaker side of the foot and distributes it evenly over the heel and ball.

You will like the Cantilever Shoe and it will help you to keep beauty and health.

Cantilever Shoe

Cantilever Stores— Cut this out for reference

Go to one of the stores below or write the manufacturers, Morse & Burt Co., 418 Willoughby Avenue, Brooklyn, N. Y., for the address of a more conveniently located Cantilever agency

Akron—11 Orpheum Arcade (Main & Market)
Albany—Hewett's Silk Shop, 15 N. Pearl St.
Allentown—955 Hamilton St.
Asbury Park—R. Bowne, 621 Cookman Ave.
Asheville—Pollock's
Atlanta—126 Peachtree Arcade
Atlantic City—2019 Boardwalk (Nr. Shelburne)
Augusta, Ga.—Saxon-Cullum Shoe Co.
Baltimore—316 No. Charles St.
Bangor—John Connors Shoe Co.
Binghamton—Parlor City Shoe Co.
Birmingham—319 North 20th St.
Boston—189 Newbury St. cor. Clarendon St.
Bridgeport—1625 Main St. (2nd floor)
Brooklyn—334 Fulton St. (Hanover Pl.)
Buffalo—441 Main St. (above Chippewa St.)
Burlington, Vt.—Lewis & Blanchard Co.
Calgary—Hudson's Bay Co.
Charleston, W. Va.—John Lee Shoe Co.
Charlotte—226 North Tryon St.
Chicago—[162 N. State St. (3rd flr. Butler Bldg.)
[1858 Leland (near Broadway)
[6418 Cottage Grove Ave. (Woodlawn)
Cincinnati—The McAlpin Co.
Cleveland—1785 Euclid Ave.
Colorado Springs—Wulff Shoe Co.
Columbus, O.—184 E. Broad St. (at 3rd)
Dallas—Medical Arts Bldg.
Davenport—M. L. Parker Co.
Dayton—The Rike-Kumler Co.
Denver—224 Foster Bldg.
Des Moines—W. L. White Shoe Co.
Detroit—2030 Park Ave. (at Elizabeth St.)
Duluth—187 West 1st St. (near 1st Ave. W.)
Edmonton—Hudson's Bay Co.
Elizabeth—258 North Broad St.
Evanston—North Shore Bootery
Evansville—219 Sr. 3rd St. (near Main)
Fort Wayne—Mathias App's Sons
Fresno—The Bootery
Grand Rapids—Herpolsheimer Co.
Hamilton, Ont.—5 John St., North (Cor. King)
Harrisburg—217 No. 2nd St.
Hartford—Trumbull & Church Sts.
Houston—205 Foster-Bank Commerce Bldg.
Huntington, W. Va.—McMahon-Diehl
Indianapolis—L. S. Ayres & Co.
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Jersey City—Bennett's, 411 Central Ave.
Kalamazoo—The Bell Shoe House
Kansas City, Mo.—500 Altman Bldg.
Kingston—E. T. Stelle & Son
Knoxville—Spence Shoe Co.
Lincoln—Mayer Bros. Co.
Little Rock—417 Main St. (Pugh Bldg.)
Long Beach, Cal.—536 Pine Ave.
Los Angeles—726 Hill St.
Louisville—Boston Shoe Co.
Lowell—The Boot Marche
Madison, Wis.—Family Shoe Store
Memphis—28 No. Second St.
Miami—Dickins Shoe Store
Milwaukee—Brouwer Shoe Co.
Minneapolis—25 Eighth St. South
Montreal—Keefer Bldg. (St. Catherine, W.)
Mt. Vernon, N. Y.—S. J. Rice & Co.
Nashville—J. A. Meadors & Sons
Newark—897 Broad St. (2nd floor)
New Bedford—Olympia Shoe Shop
New Brunswick—A. V. Harding & Sons
New Haven—158 Orange St. (Near Court)
New Orleans—109 Baronne St. (Room 200)
Newport, R. I.—Sullivan's, 22a Thames St.
New York—[14 W. 40th St. (opp. Pub. Lib.)
[2936 Third Ave. (32nd St.)
[13 John St., Bet. B'way & Nassau]
Norfolk—Ames & Brownley
Oakland—510-11th St. (Opp. City Hall)
Oklahoma City—Foster's Boot Shop
Omaha—1708 Howard St.
Ottawa, Ont.—Murphy & Gamble, Ltd.
Pasadena—678 E. Colorado St.
Passaic—4 Lexington Ave. (at Erie Depot)
Paterson—18 Hamilton St. (opp. Regent Theatre)
Pawtucket—Evans & Young
Peoria—185 So. Jefferson St. (Lehmann Bldg.)
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Pittsfield—Paley's, 234 North St.
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Rochester—257 Main St. E. (3rd floor)
Sacramento—214 Ochsner Bldg. K. near 7th
Salt Lake City—Walker Bros. Co.
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San Francisco—127 Stockton St.
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Springfield, Ill.—A. W. Kluhsli
Springfield, Mass.—Forbes & Wallace
St. Joseph, Mo.—24a N. 7th St. (Arcade Bldg.)
St. Louis—51a Arcade Bldg. (opp. P. O.
St. Paul—41 E. 5th St. (Frederic Hotel)
Syracuse—121 West Jefferson St.
Tacoma—253 So. 11th St. (Fidelity Trust Bldg.)
Toledo—LaSalle & Koch Co.
Toronto—7 Queen St. East (at Yonge)
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Troy—35 Third St. (2d floor)
Tulsa—Leon's Shoe Store
Utica—28 & 30 Blandina St. (nr. Union
Vancouver—Hudson's Bay Co.
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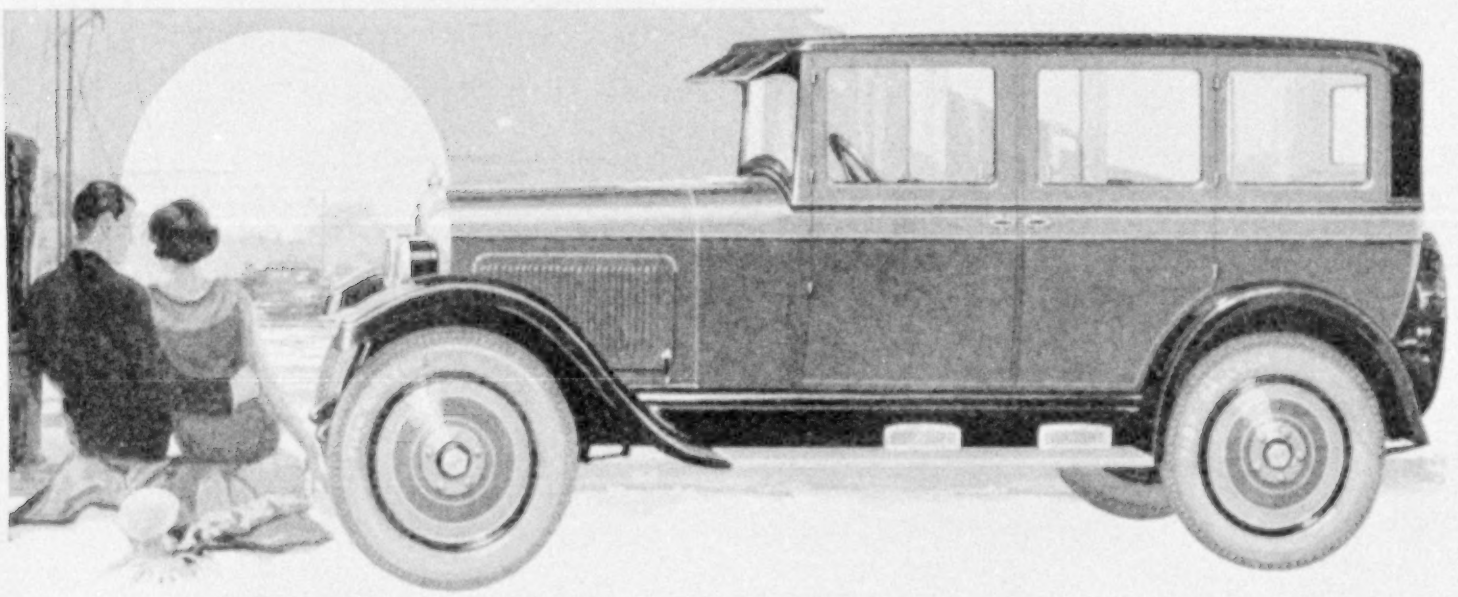

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An electric motor runs a washing machine for 3 cents an hour.

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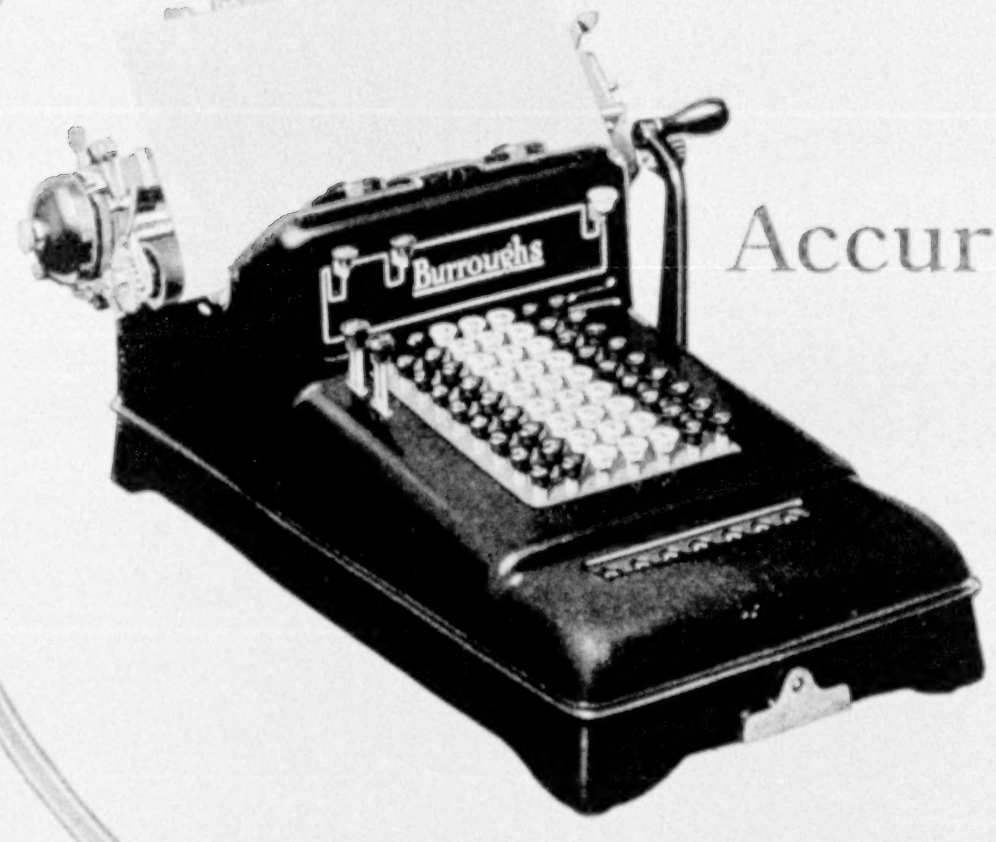

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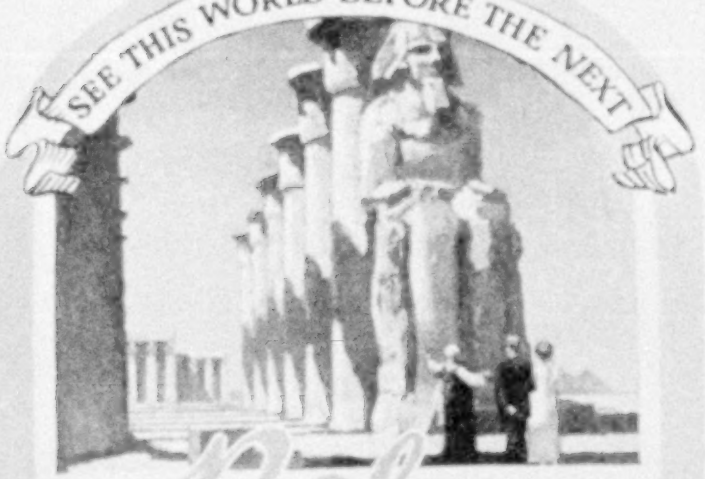

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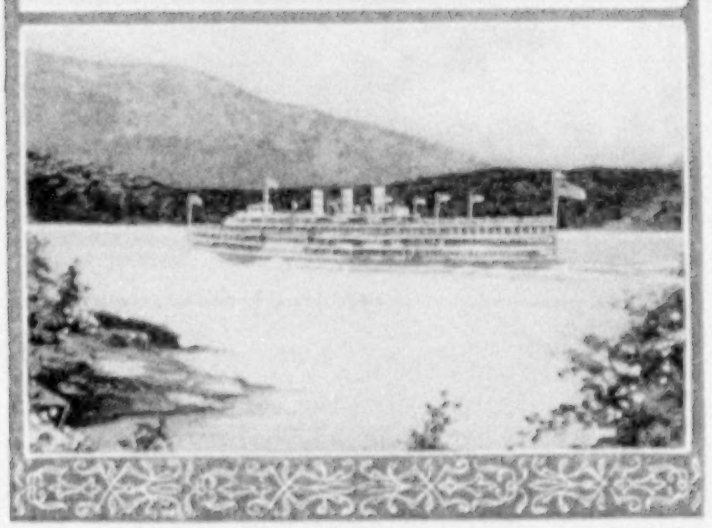

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Under that film your teeth (run your tongue across your teeth and you can feel it) are the clean, glistening teeth you envy. Combat it this way—see what pretty teeth you have.

IN the United States today, it is estimated that over half a million people a day are cleaning their teeth in a new way. These are people who used to have dull and dingy teeth. That is why you see gleaming teeth wherever your eyes turn.

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Run your tongue across your teeth. You will feel that film. Under it are the prettier, whiter teeth you envy in others. This offers you free a 10-day tube of the way authorities advise combating it. Simply mail the coupon.

The great enemy of teeth

Film is the great enemy of tooth beauty. And a chief cause, according to world's dental authorities, of most tooth troubles. It clings to teeth, gets into crevices and stays. Germs by the millions breed in it. They, with tartar, are the common cause of pyorrhea.

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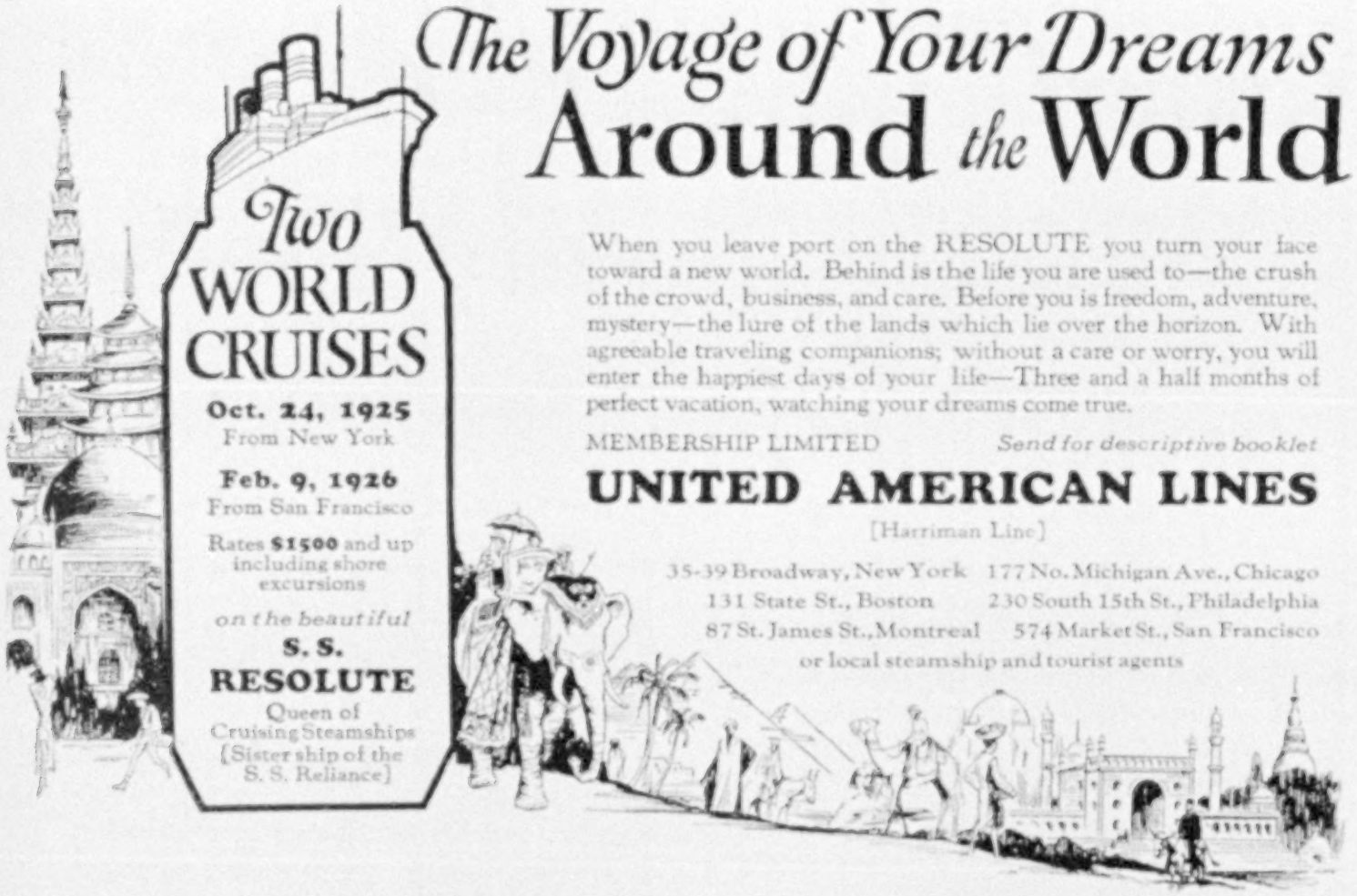
Around the World



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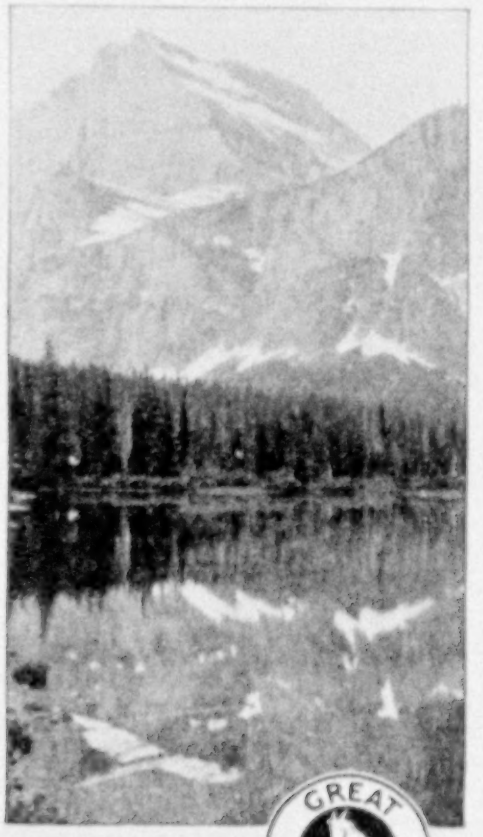

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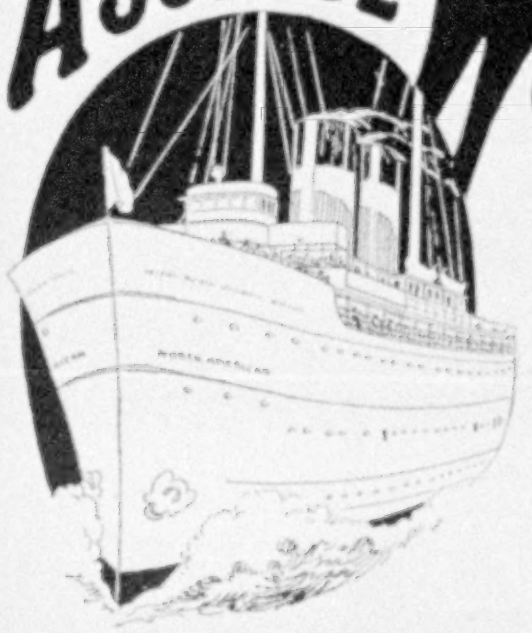

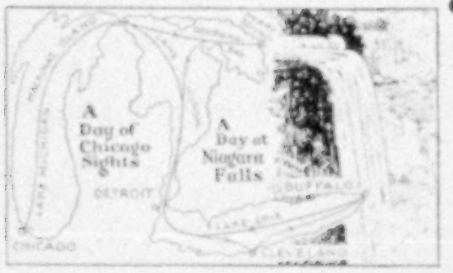

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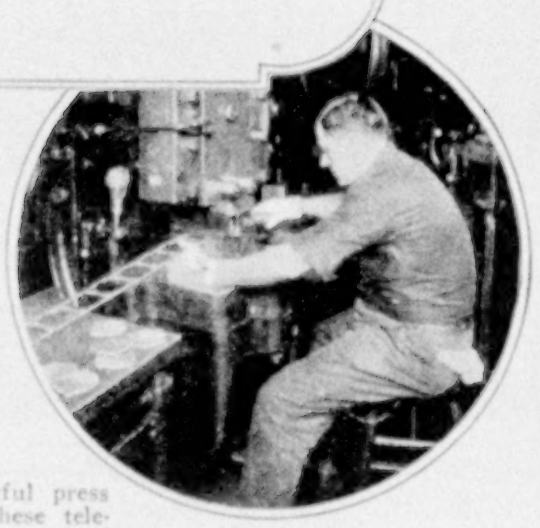
7-25

Instead of "as like as two peas," why not say "as like as two telephones"? To the smallest detail one telephone is a "speaking likeness" of another.



Here is a powerful press punching one of these telephone parts out of sheets of brass — just as cookies are cut out of strips of dough.

As like as two ~~peas~~ telephones

WHEN Nature develops a good pattern, she doesn't throw it away every year. Neither does Western Electric. Long ago we learned the economy of simplification in manufacture—making millions of telephones exactly alike.

And that means exactly alike not only in outward appearance, but also down to the little screws and mica washers and magnet coils inside. Each of the 201 parts in your telephone is interchangeable with the corresponding part in your neighbor's telephone.

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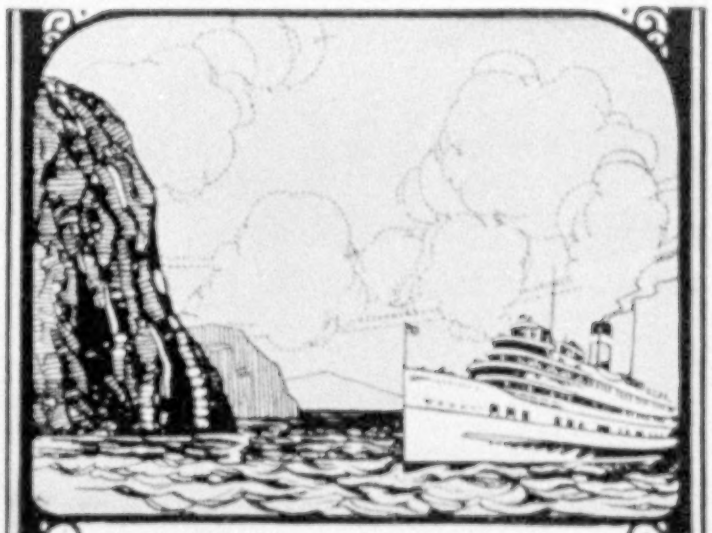

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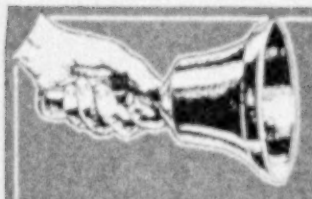

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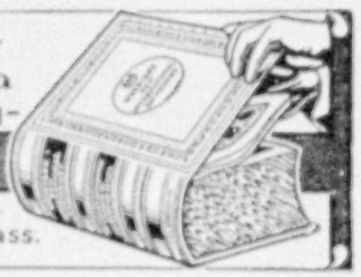

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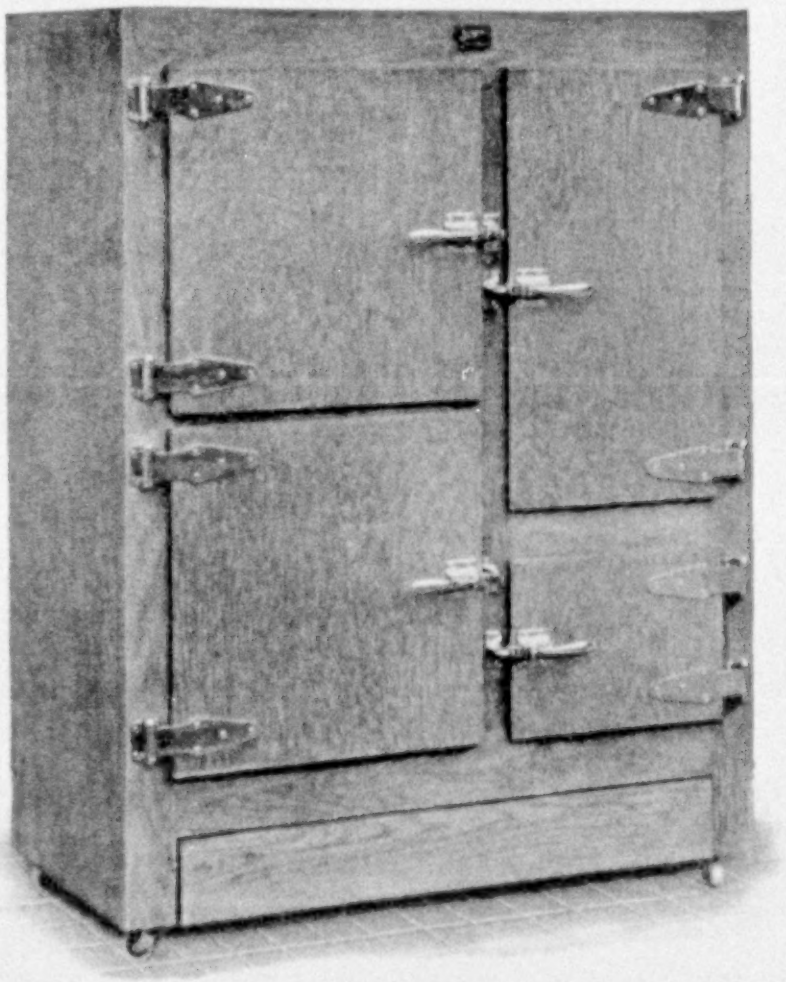

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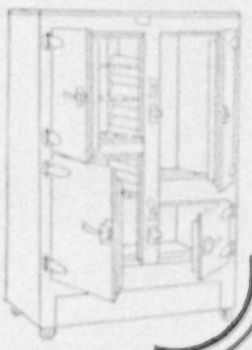

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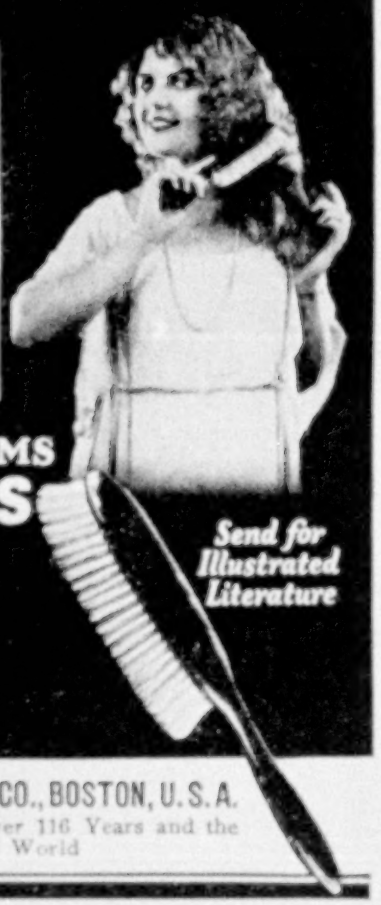

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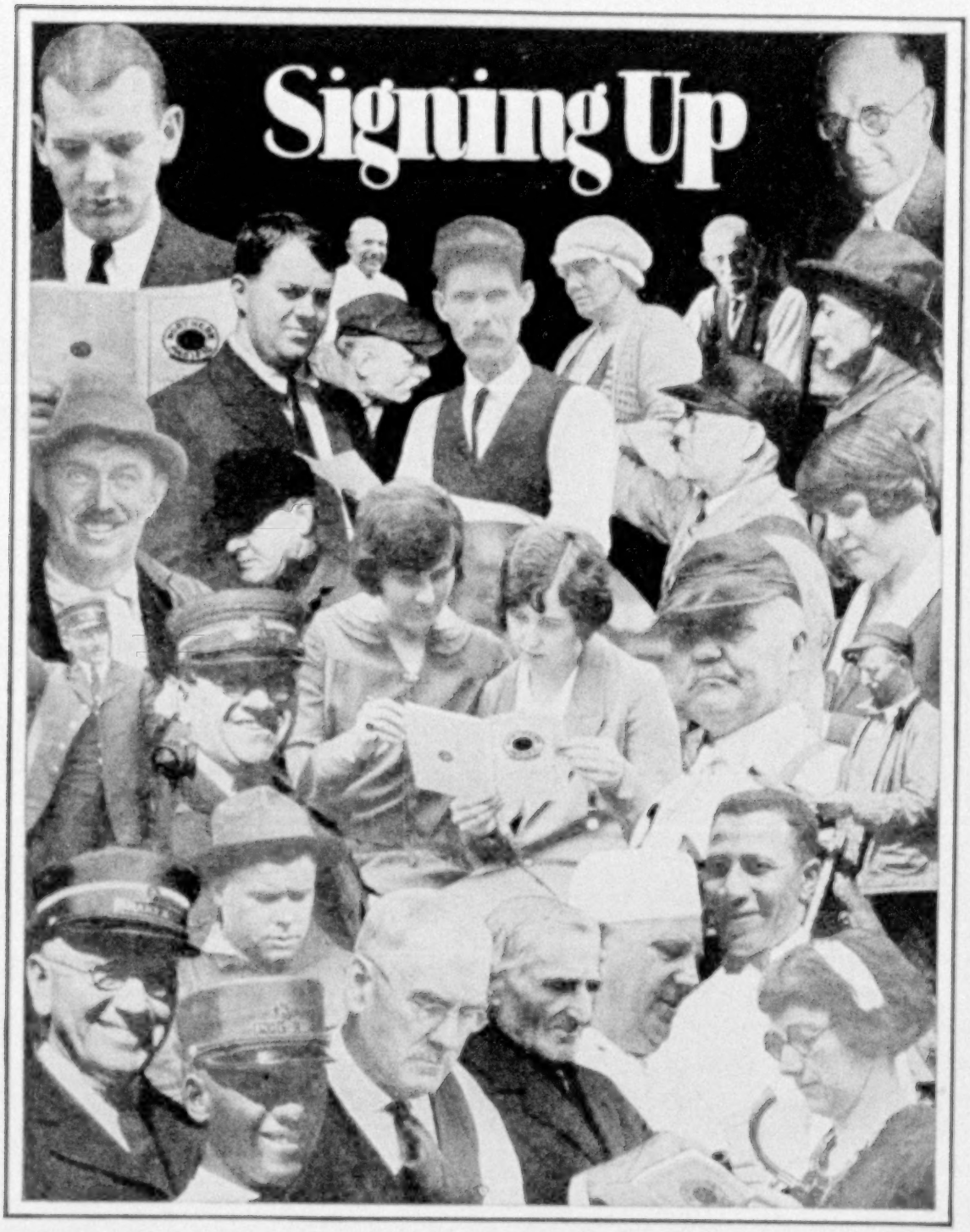

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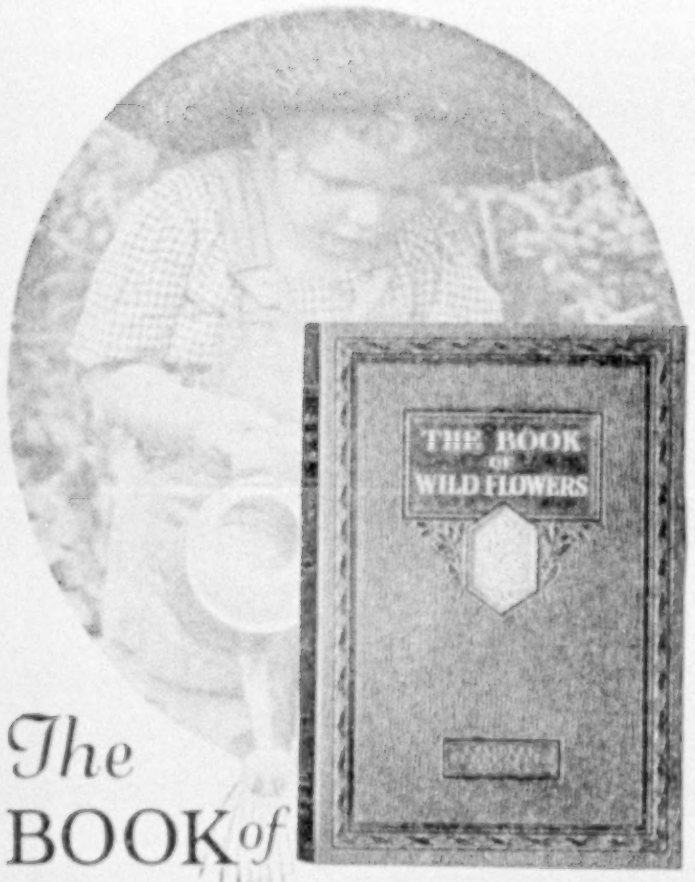

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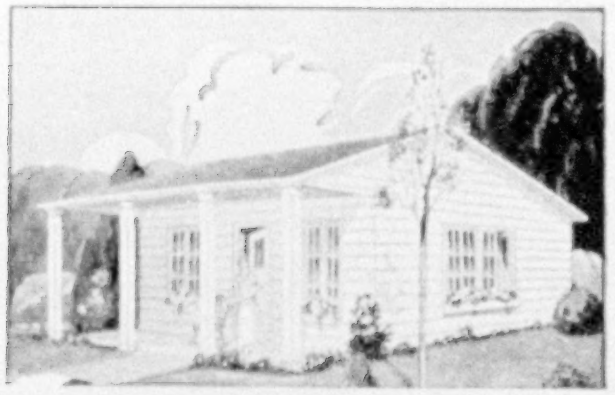

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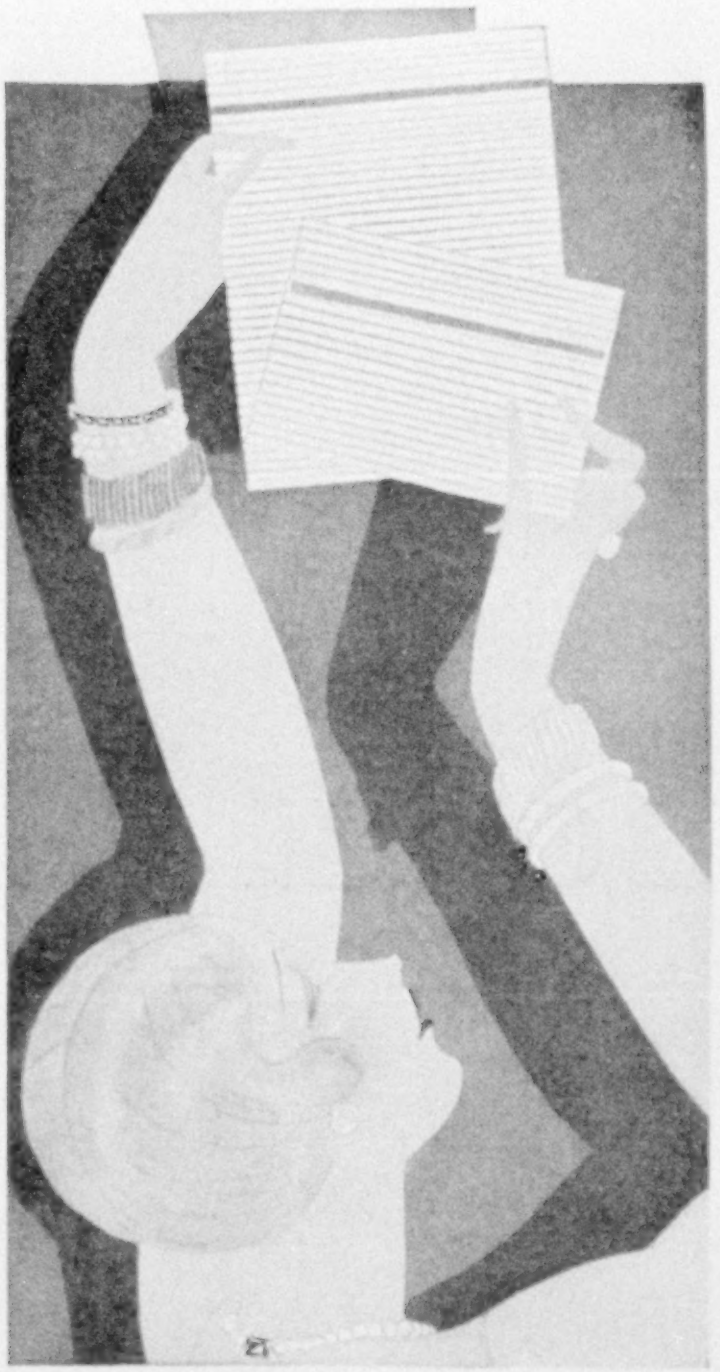

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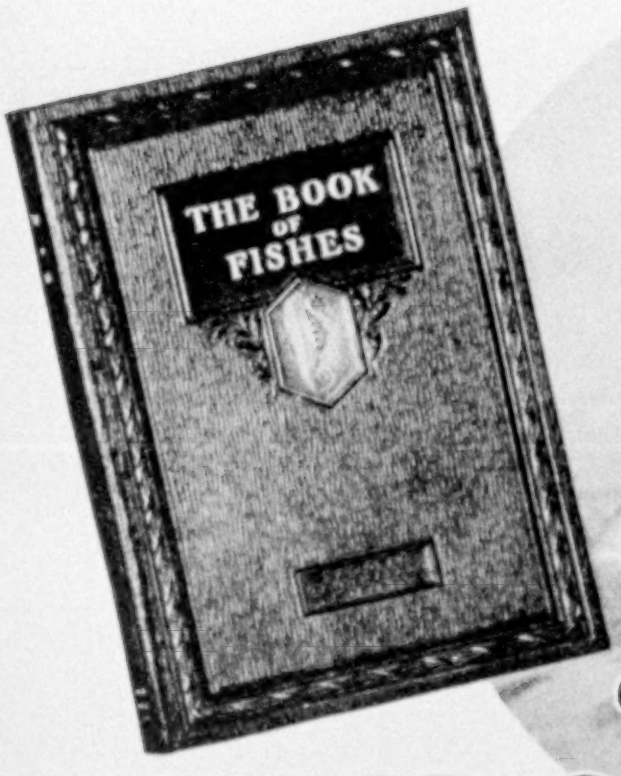

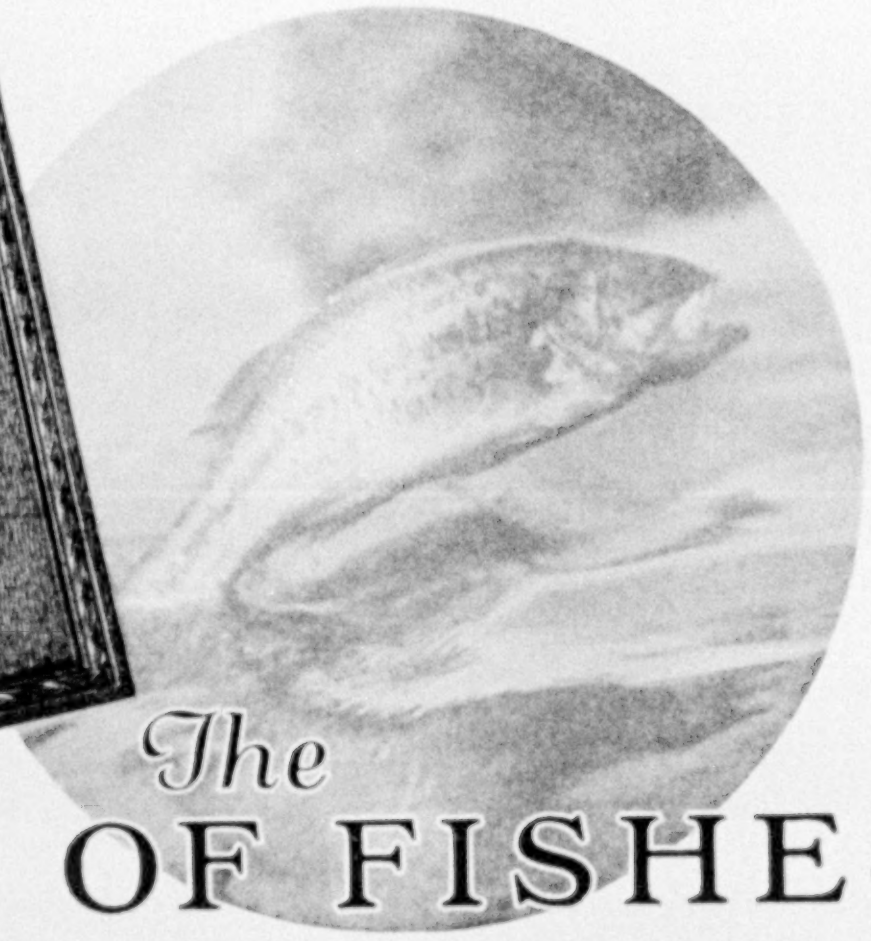

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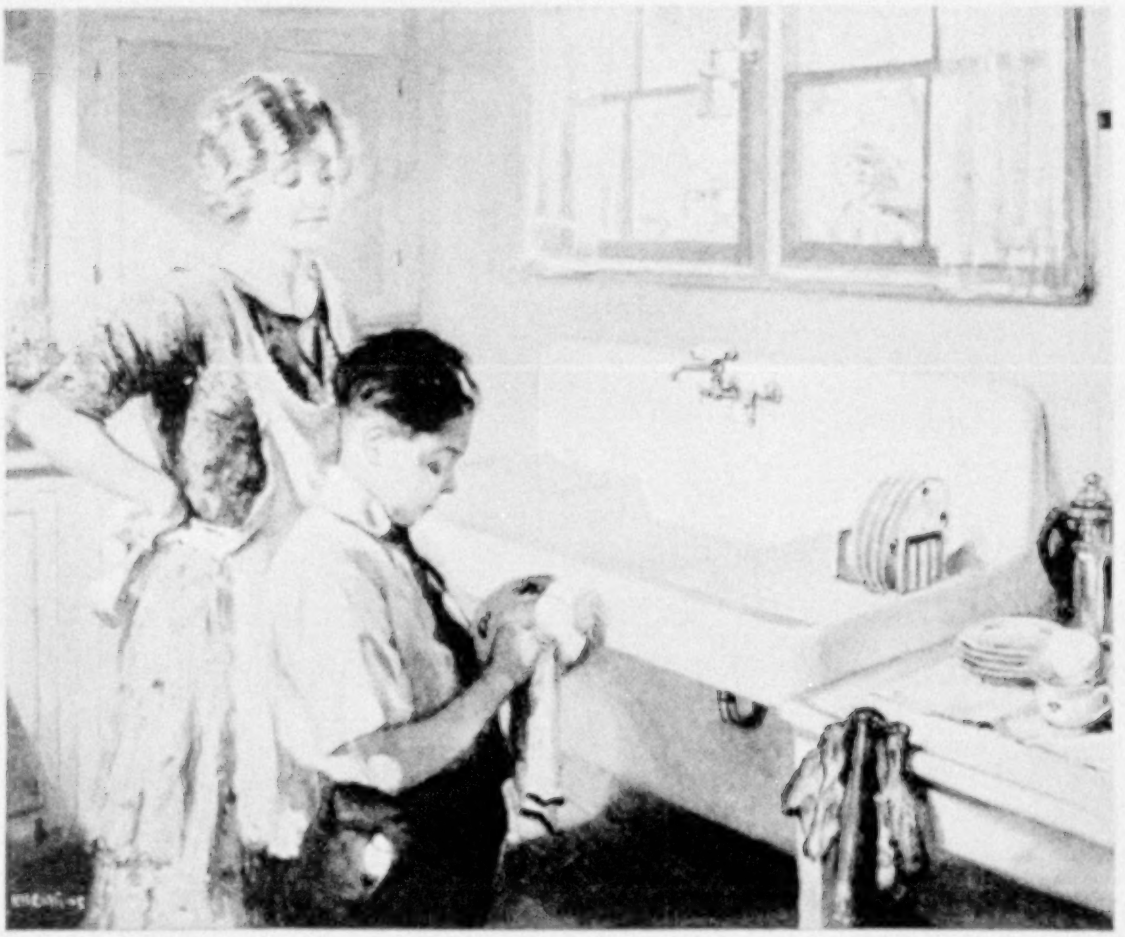

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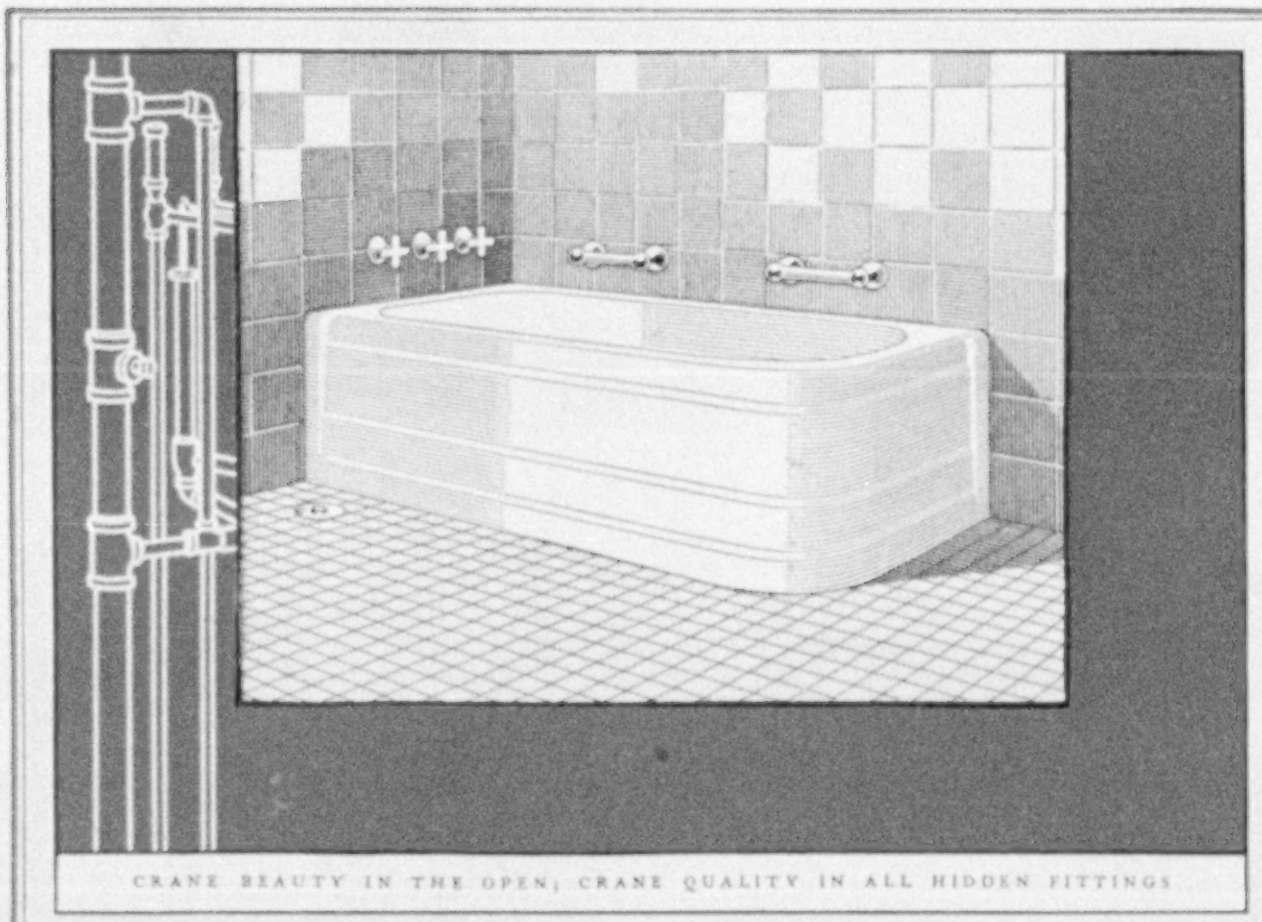

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